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Contents for July, 1929

THE TABULAR VIEW 453

PRIMITIVE THINKING 457
The occult beginnings of authentic science
BY TENNEY L. DAVIS, '13

WANDERINGS IN THE MIDDLE EAST . 460
Experiences of a petroleum engineer in the country of Darius and Xerxes
BY FREDERICK G. CLAPP, '01

THE WORLD'S FOOD 463
Will the Malthusian threat of famine continue to be frustrated by science?
BY SAMUEL C. PRESCOTT, '94

BE A SNOB 466
Further comments on a recent controversy
BY ROBERT E. ROGERS

A TECHNOLOGY DIRIGIBLE 467
Round Hill Experimental Station to use the Goodyear dirigible "Mayflower" for fog and radio research
BY EDWARD L. BOWLES, S.M., '22

WEIGHTS AND MEASURES OF ANTIQUITY 468

BOOKS 469
The History of Man, BY R. S. LULL; *The Art of "Clokying a Trouthe With Colour Tenebrous,"* BY J. R. K.; *Bibliomania*, BY J. D. C.; *Deck Scrubbing and Blackbirding*, BY C. C. C.; *Blood and Thunder*, BY H. E. L.; *and Reviews in Brief.*

VISITING COMMITTEE REPORT 471
Covering the recent meeting of the Visiting Committee for the Department of Naval Architecture and Marine Engineering. Published by arrangement with the Executive Committee of the Corporation

THE INSTITUTE GAZETTE 474

ADVERSARIA 480

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THE TABULAR VIEW

THERE is a growing realization that scientists must know more history and historians know more science, and many are busying themselves toward this end. The American Chemical Society two years ago established a division of history, and elected as the Secretary of it TENNEY L. DAVIS, '13, Associate Professor of Organic Chemistry at the Institute, and author of the first article in this issue, "Primitive Thinking." For years Professor Davis has been doing research work in this field, as attested by the many monographs on that subject he has published and the rare library he has assembled. His contribution to The Review this month represents a segment of his investigations, the occult beginnings of the scientific method. ¶ FREDERICK G. CLAPP, '01, whose article, "Oil in the Antipodes," appeared in The Review for December, 1926, continues his professional peregrinations and fortunately finds time to write about them. As chief geologist of the Associated Geological Engineers, his work takes him all over the world. More specifically, he is a petroleum engineer specializing in reports on oil and gas properties. He has conducted a geological exploration of China, made special investigations in Australia and New Zealand, and acted as petroleum advisor to the Imperial Government of Persia. It is of his work in Persia that he writes in this Review.

SAMUEL C. PRESCOTT, '94, Professor of Industrial Biology, has been carrying on the work begun by William T. Sedgwick as Head of the Department of Biology and Public Health. His interest in food supply is of long standing. In 1905 he founded in Boston a Biochemical Laboratory in which many food problems were studied. In 1912 and 1913 he made several trips to the tropics and organized a research laboratory for the United Fruit Company. The World War called and he became a Major in the Food Division of the Sanitary Corps and served as the officer in charge of food storage and research problems. His $30,000 cup of coffee will be recalled by newspaper readers of several years ago and those who read books might have read the sketch of him and his work in "Industrial Explorers" (Harpers), by Maurice Holland, '16, and Henry Pringle. ¶ The development of Technology's experimental radio station W 1XV at South Dartmouth, Mass., on the estate of Col. E. H. R. Green has been supervised by EDWARD L. BOWLES, S.M., '22, who writes on page 467 of the great program of expansion that is now being undertaken there. Professor Bowles received his B.S. from Washington University. Since 1927 he has been an Associate Professor of Electrical Communication.

ROBERT E. ROGERS, whose advice to the graduating class at Technology recently aroused the press to varied comment, was graduated from Harvard in 1908. The following year he received his Master's degree from the same college. He came to the Institute as an Instructor of English in 1913, became an Assistant Professor in 1917

(*Concluded on page 454*)

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THE TABULAR VIEW

(*Concluded from page 453*)

and an Associate Professor in 1923. Readers of The Review will recall that as Editor of The Review from 1917 to 1922, he earned the distinction of being the only non-Technology man to hold that post. Professor Rogers is in much demand as a lecturer and has been giving University Extension courses for a number of years. Since his talk to the seniors letters of comment have poured in upon him and the Institute's administrative officers.

ONE of the administrative policies of President Stratton has been to give the different Departments of the Institute an opportunity to obtain advice and cooperation from leaders in the industries for which the Department trains students. Accordingly there has been created the Advisory Committees that meet with Faculty members of the Departments to discuss educational and industrial needs. To supplement this system of Advisory Committees there are for the different Departments Visiting Committees composed of members of the Corporation. These committees contribute much to a better understanding between the Corporation, the Faculty, and the industrial world. The Corporation, wishing to publish and emphasize reports and transactions of the work of these committees, has asked that they be published in The Review. Many have already been presented and the Visiting Committee Report on the Department of Naval Architecture and Marine Engineering this month continues the series.

VOLUME XXXII of The Review will be initiated with three changes in its staff. JOHN D. CRAWFORD, '27, Assistant Managing Editor, has accepted a position with the General Radio Company of Cambridge, Mass. Although he assumed his new responsibilities several months ago, he continued as a member of The Review Staff until June 30. ¶ RALPH T. JOPE, '28, Circulation Manager, becomes Business Manager on July 1, with advertising and circulation — especially dues collection — under his jurisdiction. ¶ MISS CATHERINE C. CARLSON, for three years a member of the staff, becomes an Editorial Associate at the same time. For the second time in its thirty years The Review carries in its masthead the name of a non-Technology person, Miss Carlson having obtained her A.B. from Smith. ¶ In his departure Mr. Crawford carries with him the best wishes of the entire organization that profited from his effective work and enjoyed his association. The Review also regrets the departure of MISS GERTRUDE L. BUTLER, for four years a member of its staff. Her competency will be sorely missed.

THE Review is not published during the summer months following July. This issue concludes Volume XXXI. Number 1 of XXXII will be published on October 27, and dated November. Readers who bind their copies of The Review are reminded that if they possess eight numbers of Volume XXXI, their files are complete. An index to the Volume will be ready on September 15, and will be supplied post-free upon request.

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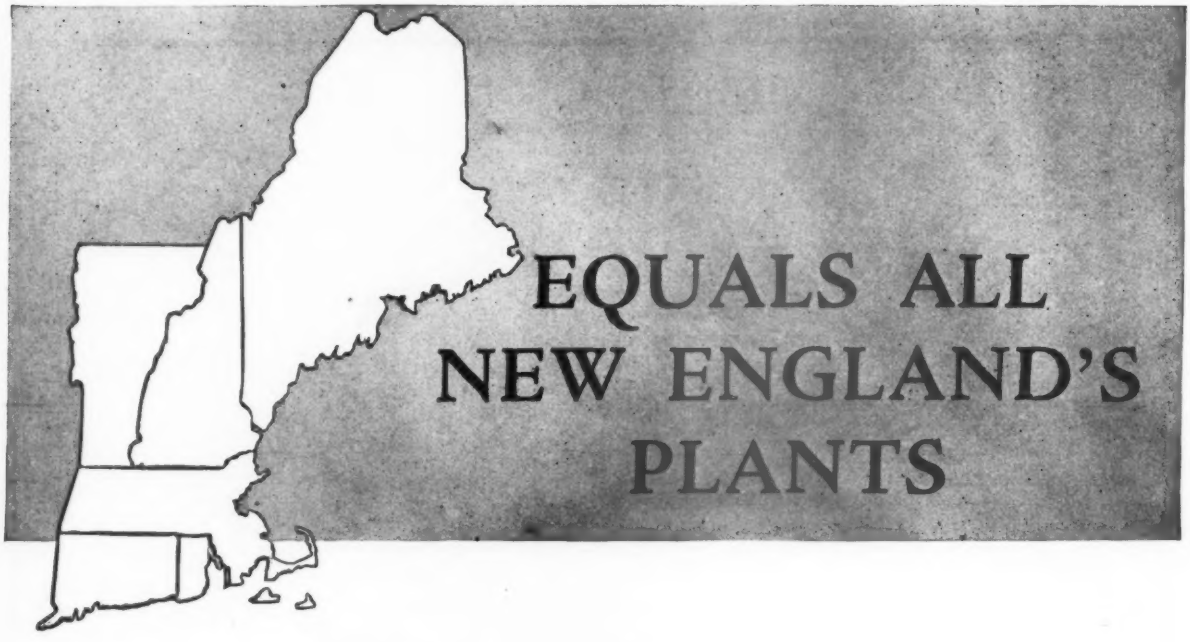

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The TECHNOLOGY REVIEW

VOLUME 31 · JULY, 1929 · NUMBER 8

PRIMITIVE THINKING

The occult beginnings of authentic science

BY TENNEY L. DAVIS, '13

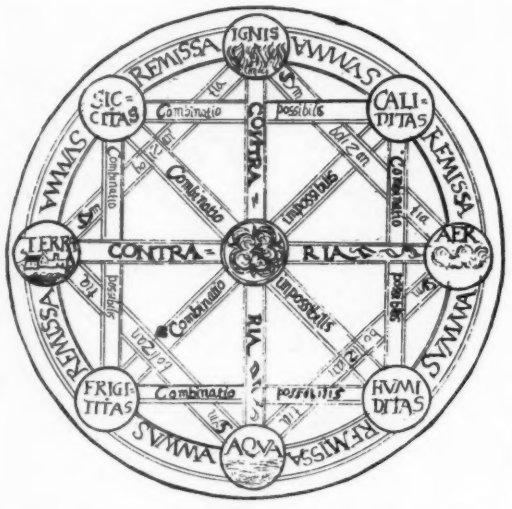
"*LE MONDE est aujourd'hui sans mystère*" says Berthelot in the opening sentence of the preface to his work on the origins of alchemy. "The intellect claims to clarify and to understand all things and to give them a reasonable and positive explanation. — The notion of the miraculous and supernatural has vanished like a vain mirage, a superannuated prejudice."

Berthelot's study of alchemy goes back to a time when miracles were common, to a time when science and philosophy had not yet largely rationalized the phenomena of nature, to a time which seems sufficiently remote from the work-a-day, matter of fact, well-ordered world of the present time. But it is possible to go much further back and, for a proper understanding of the development of science, it is necessary to do so. Before there could be any question of what was miraculous and what was natural there must necessarily have been a description and classification of the data, a precise specification of the matter about which the question, whether it was miraculous or natural, was later to be raised. There was first a comprehension of the things before there was any discussion about them. In this article I wish to push the inquiry as far back as possible toward the "blooming buzzing confusion," as William James has called it, of that chaotic "mere experience" out of which the human understanding has emerged. In the beginning there was chaos. In due course and by a process, classifications were set up — the moving shadow shapes of experience were found to possess an order. The process by which this order was created was the very beginning of science.

FRONTISPIECE OF "INTROITUS APERTUS AD OCCLUSUM REGIS PALATIUM" BY EIRENAEUS PHILALETHES, PRINTED AT FRANKFURT-ON-MAIN, 1706. THE WORK WAS ACTUALLY WRITTEN BY GEORGE STARKEY WHO GRADUATED FROM HARVARD IN 1646. NOTE THE SEAL OF SOLOMON, THAT IS, THE TWO INTERLOCKED TRIANGLES; ALSO THE SYMBOLS OF THE SEVEN METALS AND THE SERPENT WITH ITS TAIL IN ITS MOUTH REPRESENTING THE UNITY OF MATTER

In the beginning mankind found itself confronted, just as each one of us has been, with sights, sounds, odors, with data of the senses. In the beginning these data were without names and without order. They simply happened; they were as they fell out. *Facta sunt.* Just as a child seeing light recognizes it as similar to light which it has seen before, so man, for some reason or other, came to distinguish certain recognizable recurrences in his experience. These recurrent data, whether named or not, by their recognized similarity were distinguished from all other data and set apart. Two classes of data were thereby inaugurated. Intelligence created its first order — made its first classification — when it divided chaos into two parts, the one part being x, the other part not-x. So also the logicians point out that the beginning of thinking is in the application of the law of contradiction, namely, that a given proposition is either true or false, that a given datum is either x or not-x. Either yes or no. Either is or is not. Either this or not-this. With this principle any chaos whatsoever may be classified, any diverse collection may be subdivided. It is the most primitive and simple — and the most natural — of all intellectual activities. It was the first, the beginning of all science of course, the beginning of all human thinking as well.

Early thinkers were interested in such obvious opposites as active and passive, alive and dead, male and female, positive and negative, hot and cold, wet and dry, and so on. In its



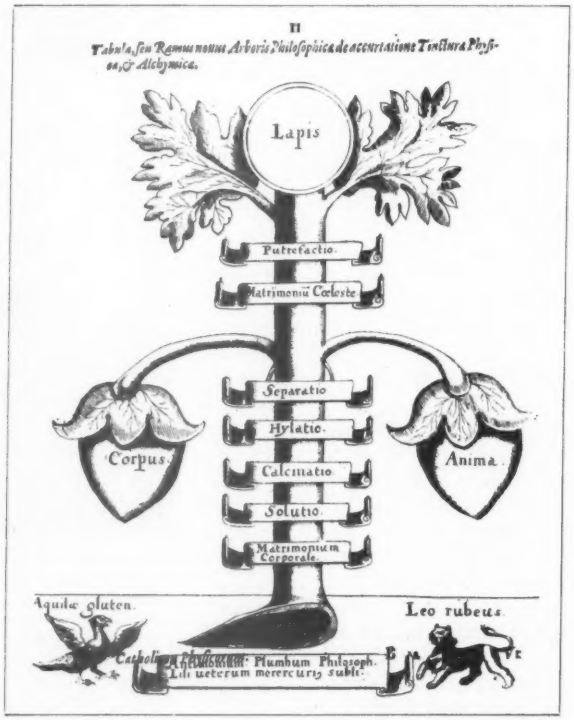
THIS EXCEPTIONALLY FINE CROSS OF CONTRARIES FACES THE TITLE PAGE OF LEIBNITZ' "DISSERTATIO DE ARTE COMBINATORIA," LIPSIAE, 1666

main outlines the first chapter of Genesis is without question a correct account of the beginnings of science. Day was distinguished from night, earth from air, and fire from water. The four so-called "Aristotelian" elements were separated and assigned their places. In the oldest religions of which we have any record, the Sun was regarded as the male principle, positive, hot, active, and so on, and was worshipped as a god, but there was also the female Moon goddess, cold and passive. "The father of it is the Sun, the mother of it the Moon. — Its nurse is the Earth." — as was written in the Emerald Table of Hermes Trismegistus at least as early as the beginning of the Christian era. Yin and Yang have dominated the thought of the Chinese for 2,000 years. Sometimes also the Earth goddess personified the passive principle of fecundity, for the action of the Sun in bringing heat, light, and life to the Earth was apparent enough. In the Eighth Century, A.D., the Arab, Jabir, commenced an epoch in the history of chemistry by teaching that the metals are composed of a positive, active, combustible principle which he called sulfur, and and of a negative, passive principle of substance which he denominated mercury. The sulfur of Jabir was later known by the name of phlogiston, and his ideas dominated the science of chemistry until about the end of the Eighteenth Century.

The distinction of opposites, however, is only the beginning of understanding. It enables us to mark our data and name them, but it gives us no feeling of ease and assurance, no feeling that we know *about* them. It is necessary to bring them together again. For every pair of opposite terms there is a third, which includes and mediates between them, as the idea of temperature mediates between hot and cold. With a comprehension of the third, we have a real grasp of the opposites; we can handle together the things which we have separated, we know around and about them and have understanding.

One-two-three; positive-negative-neutral. This is the frame upon which must be stretched whatever it is that we wish to understand. This is the mode of all knowing. If we wish to know a man, we must consider him as active subject (What does he think of himself?); as passive object (What do his fellows think of him?); and thirdly, the man as he really is. The philosophy of Hegel is but a reiterated insistence upon the three — the Thing, its Own Other, and the Thing-in-Itself. If we wish to think of God, we are obliged to think of Him as Active Power, as passive object, that is as that which possesses passivity and undergoes the Passion, and thirdly as the Spirit which determines and terminates the action. If we wish to think of electron, the term is really meaningless unless we think of proton, but that term is meaningless too unless we conceive both electron and proton as constituting an atom.

Ancient observers of nature early discovered that the positive qualities of the various kinds of matter could be subdivided into positive qualities of two kinds, that the negative qualities could be subdivided profitably in the same manner, and accordingly had two positive and two negative qualities, or two pairs of contraries, for the description of material objects. Combination between contraries was impossible, hot could not combine with cold, nor wet with dry. Where combinations were possible, the bundles of qualities which resulted were elements, and such elements for many centuries were found to be adequate for the description of natural objects. The qualities, hot and dry, were embodied by the element, fire; their opposites, cold and wet, were embodied

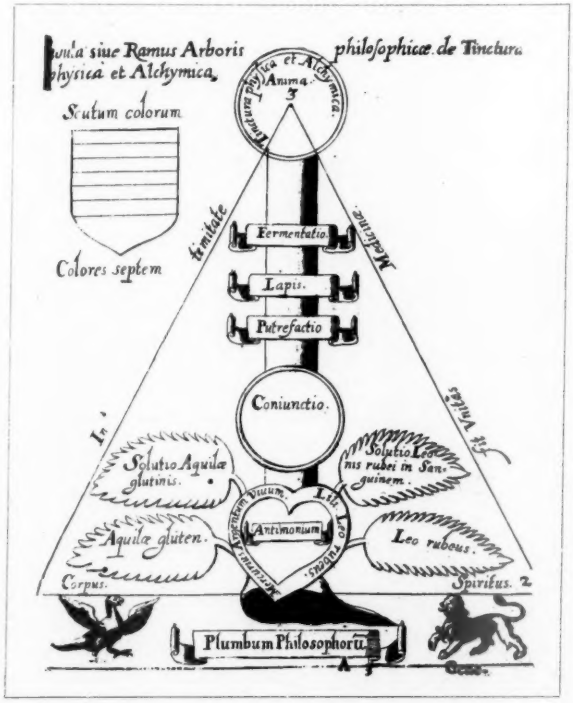


SYMBOLIC ALCHEMICAL DIAGRAM FROM THE "CATHOLICON PHYSICORUM" OF SAMUEL NORTON OF BRISTOL, FRANKFURT, 1630. NOTE THE USE OF THE IDEAS OF THREE AND SEVEN

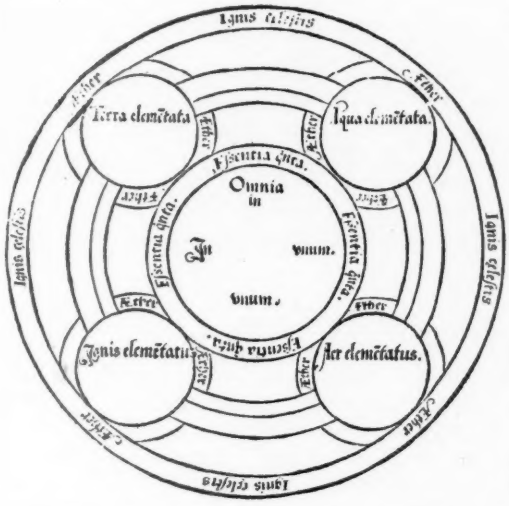
by water which was the opposite of fire. Earth was cold and dry, while its opposite, air, was warm and moist. The Aristotelian doctrine thus taught two pairs of contrary qualities and two pairs of contrary elements, a teaching which submitted to very pretty geometrical representation, as the "crosses of contraries" in early works on science abundantly testify. Just as a single pair of contraries has a mediating third, so the two pairs, the four terms, have a corresponding fifth. Plato called this fifth term Logos (God or Reason) while the mediaeval scholastics called it *quinta essentia*, fifth being or quintessence, and sometimes confused it with the Philosopher's Stone.

Whoever understands one-two has begun to assemble his information. Whoever understands one-two-three knows the structure of knowledge. These truths are simple and old, very old, so old indeed that mankind has largely forgotten them, so simple that we follow the procedure instinctively without giving heed to the process. They are so deeply imbedded in the mind of the race, so firmly fixed below the ordinary surface of consciousness, that they are hidden or occult. They are the beginning of occult science, in particular of that occult number theory which has been named after Pythagoras but which actually is as old or older than recorded history.

If one-two-three represents knowing, we may know about knowing by treating this one-two-three in the same way that for purposes of ordinary knowing we treat the single datum. So, it seems, the ancient thinker probably reasoned. Just as for any single term, which



SYMBOLIC ALCHEMICAL DIAGRAM FROM THE "CATHOLICON PHYSICORUM" OF SAMUEL NORTON OF BRISTOL, FRANKFURT, 1630. AGAIN NOTE USE OF THE IDEAS OF THREE AND SEVEN



CROSS OF CONTRARIES FROM RAYMUND LULL'S "PRACTICA SUPER LAPIDE PHILOSOPHICO," COLONIAE AGRIPPINAE, 1564

may be regarded as positive, there is a corresponding negative, and for the two there is a neutral third; so for this single triad there is a second and a third, and the three triads represent knowledge about knowing, thus:

	Positive	*Negative*	*Neutral*
First or Positive Series.....	1	2	3
Second or Negative Series..	4	5	6
Third or Neutral Series....	7	8	9

The number seven here occupies the significant position of the first member of the third or mediating series. Whoever understands seven is on his way to knowledge about knowing. Whoever understands nine has attained it. The numbers three, seven, and nine, are therefore particularly important in all human affairs. Since a knowledge of knowing is all that man can wish or hope for, and since nine represents it, ten stands for something beyond the reach of human endeavor. Ten is the divine number, the number of the Commandments of God which Moses brought from the mountain, the number of the Orders of the Blessed in the Kabbala.

The years of a man's life are traditionally set at threescore years and ten (7×10). The first seven years are his childhood, the second seven his boyhood, and the third seven his youth or young manhood. When he has lived for twenty-one years (3×7), he attains his majority and becomes a man. The forty-ninth year of his age (7×7) is the time of the "lesser climacteric," a critical period in his life. And the sixty-third year (7×9) marks the "grand climacteric," a very dangerous time. If he survives it, he will live out all the years which have been allotted to him.

We have seven days in the week, though it is apparent that the number is arbitrary and a matter of tradition. On the seventh day God rested from his labors — and found them good. There are seven heavens in the Mohammedan theology. The ancients had (*Continued on page 484*)

NAVIGATION ON THE TIGRIS AT BAGDAD

WANDERINGS IN

Experiences of a Petroleum and

BY FREDERICK

EARLY in the morning of August 18, 1927, the Italian steamer, *Sardegna*, dropped anchor at Beirut. After disembarking and arranging for transportation eastward through the office of one of the numerous sons of that enterprising gentleman, Thomas Cook, I amused myself in trying to escape from the thousand and one different kinds of "squeeze" that one encounters in countries east of the Mediterranean Sea. At the request of the Persian Government I was on my way to that country to act as petroleum advisor to its government. As an avocation of escape I welcome this opportunity to write of my experiences as a traveler on that mission and to eschew mention of my experiences as an advisor. Of course, there is, as advisor, much about which I might write: obstacles encountered, technical and political questions tackled and solved, laborious office work, advice to ministries, the framing of proposed oil and mining legislation, the story of the Semnan and its cleverly concealed enterprises, oil schemes, stratagems, and conspiracies. I might tell of the many cordial invitations from Persians to join with them in true Persian style, with or without forks and knives, with or without tables and chairs. I might describe the blemishes, virtues and vices, advantages and disadvantages of Tehran. I might even write a book on the intricacies of Persian politics and their effect on world politics and the Middle East developments.

But these I am foregoing that I may indulge in a literary interlude unimpeded by weighty matters. I proceed, therefore, with an account of my journey.

Leaving Beirut in a touring car belonging to the Nairn Eastern Transport Company, I made the ascent of the Lebanon Mountains from which, at a height of 5,000 feet, I viewed the placid blue sea. Then descending, I passed enticing vineyards to the Plain of Coelesyria, crossed the Anti-Lebanons, and arrived at the historic bazaars of Damascus before dark.

RUINS OF TEMPLE OF JUPITER, BAALBEK, SYRIA

With a certain regret at leaving this attractive city, I boarded a spacious six-wheeler automobile for Bagdad, the City of the Caliphs, some three hundred and fifty miles away. The irrigated valley grew more and more barren as we crossed the low plateau with its slightly higher cappings of basalt, till we reached the real desert, without a sign of civilization other than the rest-house of Rutbah which looked for all the world like the desert stronghold so vividly described in "Beau Geste." This route saves several weeks of travel in comparison with the Red Sea route which is so uncomfortable in midsummer. I was cheered on this route, however, by having pointed out to me in the desert not far from the international frontier between Damascus and Bagdad the place where desert bedouins occasionally intercept motor caravans.

I stopped to call on the Forty Thieves in Bagdad and then left by rail for Khanakin near the Persian frontier. This is the site of the recently completed refinery of the Khanakin Oil Company. Again we went through customs and filled a touring car and a truck with my luggage. Most important in my hand luggage was the Flit gun which the agent had insisted that I take. In the next few days I had occasion to give thanks many times for that Flit gun.

Two hours after our departure from Khanakin our journey, so auspiciously commenced, was unceremoniously interrupted. My driver, Sub Rie, and I were turned into one of the dirtiest quarantines in the world at Kasr-i-Shirin, just inside the Persian border. For four days, in company with Persians, 'Iraqis, Near Easterners, and Europeans, we sweltered in the half-shade of a tent or promenaded, pajama-clad, under police supervision through the town's main street to the miniature willow grove on the river bank. This was the only spot where even partial relief could be found from the terrific heat of 120° F. in the noonday shade. Five nights we slept on cots

THE MIDDLE EAST

Engineer in the Country of Darius Xerxes

G. CLAPP, '01

ONE OF THE IMPOSING GATES OF TEHRAN

set on sun-baked gravel, guarded by a police station on one side, a Moslem cemetery on the other, and a barrier gate before us. On the fifth day this gate was raised to allow us to enter Persia. Leaving behind the ruins of old Kasr-i-Shirin, we ascended the Paitak Pass and crossed the fertile valley of Karind full of green grass, harvested wheat, and occasional vineyards.

We made several stops to inspect historic sculptures at Takt-i-Bostan and Besitun before we reached Tehran at the end of August. The following morning I was furnished with an office and commenced work as petroleum advisor to the Imperial Government. Not many days were required to make the discovery that the "*mañana*" of South America is insignificant compared with the "*pas-farda*" (day after tomorrow) of the Persians. Some philosopher has remarked that any person who goes to Persia must either have learned patience before going there, must learn it while sojourning there, or will sojourn and leave the country without having learned it. Fortunately, my Chinese experiences had taught me a certain degree of patience, and I made the best of a situation without attempting the proverbially impossible feat of hurrying the East.

After many weeks of aggravating delays, a departure was made from this plateau city of Tehran for the low regions of the Caspian coast. We crossed the magnificent Elburz Range at an altitude of 8,000 feet and then descended to Sary and Bandergaz. At this last named place the American railroad engineers under William B. Poland, '90, Administrator General of Railways, had constructed some fifty kilometers of good grading before the German syndicate took the work from them.

Eastward, over poor roads, we went into the heart of Astrabad Province, to visit Astrabad City, Gambad-i-Kabua, and the seat of the ancient kingdom of Gurgan, with its extensive ruins. The return to Sari and Barfarush was made with the greatest difficulties, for winter had come, and the automobiles were frequently mired. I changed my mode of transport and jogged on for monotonous days on mule back, through the water-covered rice-fields, the forests, and along the shore of the Caspian. It was on Christmas Eve that I reached the city of Lahidjan in the eastern part of Gilan Province. I returned to Tehran, stopping at Rasht and Pahlevi, by automobile on New Year's Day.

A rule that must be adopted in Persia is never to travel with only a single automobile, for too often a party is stranded miles from a village, out of reach of garage facilities, and without food and water. An extra car loaded with food and spare parts is the best kind of insurance as we proved many times when the cars got bogged, or broke through bridges. During one period of two weeks I recall that one car was obliged to go back over the road every night to hunt for the other which had become stranded because of some new difficulty. It is essential to carry one's cook, and drivers and mechanics are necessary evils. Most travelers take an experienced mechanic and an assistant driver (to whom they pay a salary of about thirty cents a day) in order to have on hand extra labor. I took in addition my secretary-interpreters, Ismail Khan Amir Shah and Farajolah Khan Dehdashti, so that the party consisted of a Dodge touring car, a Graham truck, and eight men besides myself.

EAST GATE OF DAMASCUS

When I say that it was not until six months after my arrival in Persia that I was permitted to go on an inspection trip over the oil fields, those persons who understand something of Oriental procrastination will not be surprised.

With Elgin Sherk of the American Mission in Tehran, I left Tehran in March on the Musselman's New Year's Day, leaving behind the snowy Elburz Range, with its high white cone, Demavend, and crossed the Iranian

LEFT: SCULPTURE DATING FROM 226–241 A.D., NEAR PERSEPOLIS, PERSIA. RIGHT: BACK-COUNTRY MEANS OF TRAVELING: NORTHERN PERSIA

Plateau at an altitude between 3,000 and 5,000 feet. We found the city of Ispahan, famous in Persian history, and the fictitious birthplace of James Morier's character, Haji Babi. Four days later we entered Shiraz, the former home of poets.

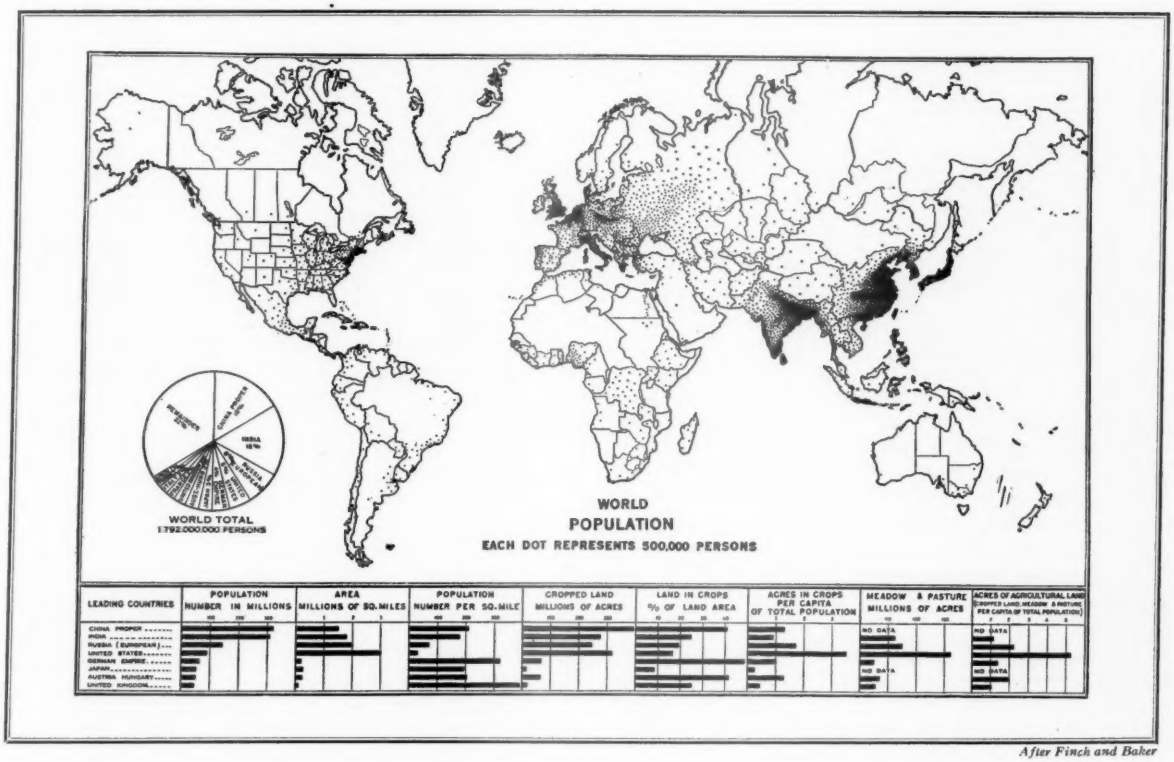
During the long journey, hunting was a daily distraction, and Amir Shah kept us well supplied with partridges, ducks, pheasants, gazelle, and other game. I had gained an early reputation for myself by bagging a fine gazelle outside of Tehran, but the Persians usually hunt gazelle by running them down with an automobile.

My decade-old ambition of viewing Persepolis, the magnificent capital of Darius and Xerxes, which was destroyed by Alexander the Great 2,258 years ago, was now realized. We found many fascinating antiquities, bringing to the imagination the splendor and power of ancient Persia. Thousands of feet of movie film were taken of historic spots, archaeological remains, bazaars, street scenes, sheiks, and veiled women.

Forty miles west of Shiraz, on our way to Bushire, we encountered the astounding descent of the "ladder." From a high divide where the highway dropped 3,000 feet in elevation in about three miles horizontally to the valley of the Tang-i-Chikan, there is one of the crookedest and most dangerous series of hairpin bends in the world. Sometimes as many as a dozen parallel roads of this series could be seen one above the other, and on many of the bends the cars had to be backed in order to prevent running over the edge to drop many hundreds of feet vertically. Two other ladders were descended before the low country was actually reached, and then miles of "gach" or gypsum deposits were traversed before we reached Bushire.

The oil district of Persia and Mesopotamia comprises a belt of perhaps 150 miles width, extending southeast for 600 to 1,000 miles from Mosul in northern 'Iraq to some unknown termination in southern Persia. The localities developed for commercial production are at Baba-gurgur near Kerkuk, the Naft-khaneh field south of Khanakin, the Masjid-i-Suleiman field northeast of Ahwaz, and the more recently discovered Haft-qel field east of Ahwaz. By far the most productive field is that of Jasjid-i-Suleiman, which has yielded all of the oil exported from Persia to date, amounting to over 240,000,000 barrels at the end of 1928. At Bushire I found myself guest of the oil company and no detail of hospitality (*Continued on page 485*)

LEFT: A VILLAGE POTTER, NORTHERN PERSIA. RIGHT: MAZANDARAN RESIDENCE ON THE PLAIN OF THE CASPIAN SEA



After Finch and Baker

THE WORLD'S FOOD

Will the Malthusian threat of famine continue to be frustrated by science?

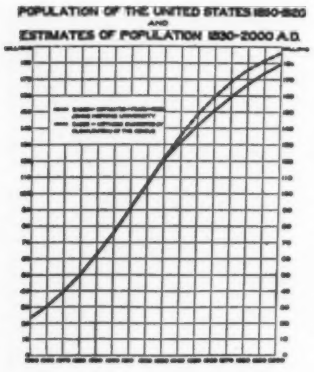
By Samuel C. Prescott, '94

IT IS easy to understand why from time immemorial the problem of food supply has occupied the mind of man since it springs from one of the most primal of man's instincts, hunger. To satisfy the desire and the need of food the savage moved his habitation from hunting-ground to hunting-ground, depending on the meat, fish, or wild fruits and plants that might be found, and later developed his primitive agriculture to guard against starvation. Such conditions may be found today in some of the more remote districts of interior Africa. Wars have been waged for food, and the instinct of self-preservation motivated the migrations of man as well as of lower creatures. At a much later period the production of food became a domestic industry engaging man's entire attention, and exchange of foods between neighboring people by barter constituted one of the early forms of trade.

From some such simple beginnings has arisen one of the most important, complex, and interesting of the social and economic problems of the present time — the world's food supply. Here is a problem not only personal and of immediate interest, but one the ramifications of which extend into many phases of national and international welfare, and which is intimately intermixed with the movements and numerical changes of populations, with the developments of science, and with that inexorable factor in the fate of civilizations, time.

THOMAS-ROBERT MALTHUS

In a superficial way, and from the standpoint of temporary necessities, our vision of the problem changes from time to time, depending on those elusive factors which we call world conditions. As we recall the meatless and wheatless days of a little over a decade ago and compare them with the present days of agitation regarding farm relief, price fixing, control of surplus, and the other phrases which enter so frequently into the lengthy discussions of the moment, we are brought to the conclusion that in a few



brief years the barriers of a reputed impending food shortage have again been pushed back. The dire calamity predicted by Malthus in 1789 and to a lesser degree by Sir William Crookes a hundred years later, is still too far in the future to cause grave concern.

The scientist, however, thinks and works not merely for himself and the momentary need but, with the spirit of genuine altruism and human service, he must perforce envision a future which in the life of the individual may be remote but in the life of a nation or of a civilization is, in scriptural phrase, but a day.

In order to foresee and estimate certain trends for the future we must review the story of food supply for the period of our national life. At the end of our Colonial Period, before the steamboat and the railroad had begun the contraction of the globe, man lived almost as he had lived for a thousand years. The Industrial Revolution had begun in England, and to some extent the change was felt in other parts of Europe and even in the Colonies, but the arts of peace were still largely small-scale domestic arts. Invention had scarcely begun to modify the methods of labor; food supply was still largely a matter of individual effort and manual labor. It is not surprising that a man of the mental capacity of Benjamin Franklin should have found these conditions worthy of discussion and analysis, for to him belongs the credit of the first modern treatment of the relation of population to food supply. He was followed shortly by Hume and Wallace in Great Britain, and later by Townsend. In 1798 the thoughtful and pessimistic Malthus, noting the force of their arguments and the public disinterest in them, felt impelled to elaborate this doctrine, to call attention anew to the relation between population and subsistence, and to the dangers that were certain to follow the unrestricted increase in the numbers of mankind.

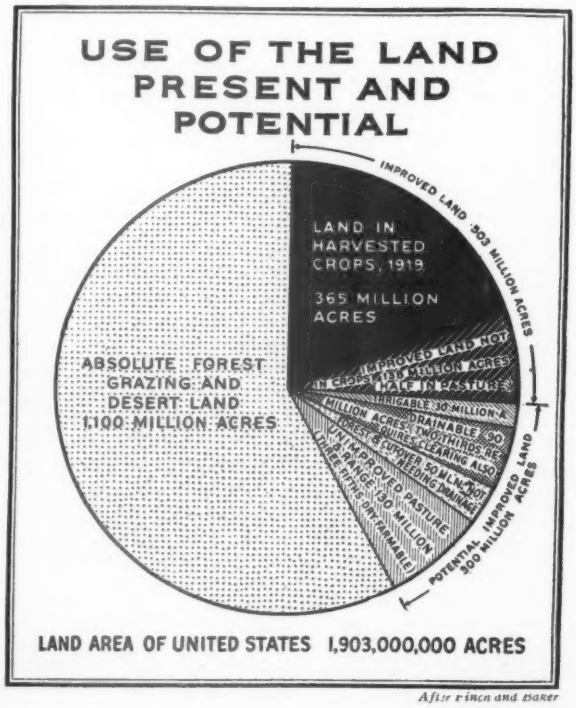
In 1800 the population of the known portion of the globe was, as nearly as can be estimated, about 750 millions, probably half of it in China, the home of real agriculture. Cities were relatively few and small. New York had but 60,000 inhabitants, although London was even at that time a city of a million souls. In America the population had hardly begun to stream into the great central valley but was almost exclusively on the Atlantic slope. The West was *terra incognita*. Canada, aside from the valley of the St. Lawrence, was a frozen blank; Australia, a mystery. Other parts of the globe, now of great significance from the standpoint of food supply, were then of no importance in this respect.

The conditions of a hundred years ago form a striking contrast to the conditions of today, with more than half of our people living in cities; with railroads, steamboats, automotive vehicles, and airplanes as rapid means of transportation; and with the telegraph, the telephone, and the wireless for instantaneous communication between distant points. These factors have vitally affected the equation of supply and demand. Furthermore, new areas have been opened up for cultivation, for exploration and migration.

IN THE general consideration of a world food problem our thoughts inevitably turn to the great staples which have for many years formed the basis of the dietaries of civilized man. We may tabulate these staples into two relatively simple lists:

Foods of plant origin Carbohydrates, proteins, and oils	1. The cereals: wheat, rice, corn, oats, rye, and barley 2. Sugar: from sugar cane and beets 3. Vegetables: potatoes, sweet potatoes, cassava, beans, peas 4. Fruits: such as the banana and the plantain
Foods of animal origin Proteins, fats	5. Meats: including beef, pork, mutton, and poultry 6. Dairy products 7. Fish and seafoods

Perhaps the one food universally considered as essential is cereal, but the importance of the other foods depends largely on the food habits of the individual. These habits have been developed in part through necessity, but national nutritional characteristics have grown up largely on the basis of the abundance of the foods most utilized or most easily obtained. Hence we find that the greatest per capita consumption of meats is in those countries like the Argentine, Australia, and the United States where meats have been abundant and relatively cheap.


USE OF THE LAND
PRESENT AND
POTENTIAL
IMPROVED LAND 503 MILLION ACRES
LAND IN HARVESTED CROPS, 1919
365 MILLION ACRES
ABSOLUTE FOREST GRAZING AND DESERT LAND 1,100 MILLION ACRES
POTENTIAL IMPROVED LAND 500 MILLION ACRES
LAND AREA OF UNITED STATES 1,903,000,000 ACRES

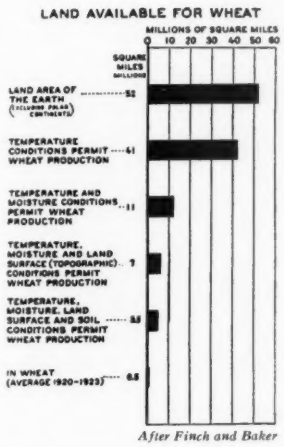
After Finch and Baker

Temperature range, rainfall and its seasonal distribution, the amount of sunshine, and soil conditions, all impose their limitations, especially on the types of food plants that have not been bred for adaptability to special conditions. They may make the difference between a safe crop and a highly speculative one. The biological principles of adaptation to environment, a natural law which man has to quite a marked degree modified through scientific application of Mendel's law, controlled the agricultural situation throughout the world until science, as well as invention, was brought to bear upon its problems. According to the Malthusian theory, the human race should have been reduced to starvation before this or else it should have become static in population. Placed in a rough chronological order, the series of events from 1880 to our own day which have reduced the gravity of the problem as Malthus saw it are here rehearsed.

In the first decade of the Nineteenth Century came the highly important discovery of a new method of preserving foods by heating them in closed containers. Thus was born the canning industry, today such an important factor in food supply. By its development the abundance of one region is available for the scarcity in another. It has made possible exploration in remote and unproductive parts of the earth, thus providing for a more varied diet and helping to fight disease. Waste and loss have thereby been greatly reduced.

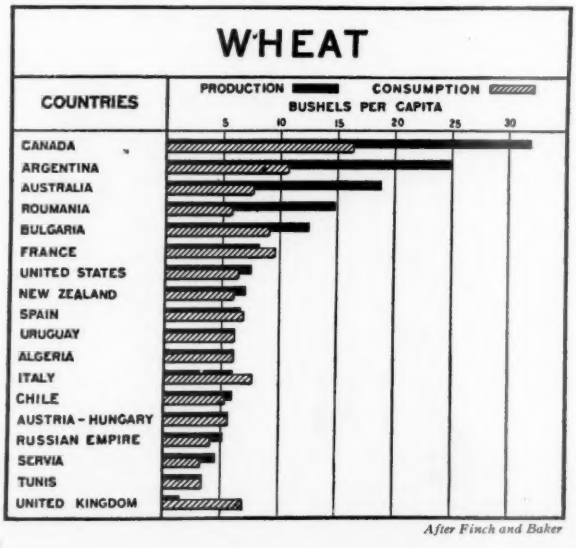
The second great factor came in the field of invention. While the steamboat and the locomotive made possible more rapid and economical transportation of foods, it was the development of farm machinery that made extensive cultivation possible. A recent writer in the *Atlantic Monthly* has asserted that by the increase in machinery and the more scientific methods of agriculture there is now a surplus of farmers amounting to possibly 800,000 out of our total of six and one-half millions. He is inclined to think that the cry, "back to the land," should be changed to "back to the factory."

One other field of invention which has had great influence on the food supply from the consumer's standpoint is the development of artificial refrigeration. In addition to preventing needless waste of food materials, it is far more important as a practical method of preserving food for transportation by means of refrigerator cars or ships. This process was made effective in 1877 when the first successful shipment of frozen beef crossed the ocean. Recent improvements in quick freezing as applied to fish, meats, fruits, and vegetables, seem to indicate that our common methods of cold storage may be completely revolutionized. With the newer processes of freezing in which ice crystals of microscopic size are produced, the damage to cells is extremely small, and changes in flavor are almost entirely prevented.


LAND AVAILABLE FOR WHEAT
MILLIONS OF SQUARE MILES
0 10 20 30 40 50 60
SQUARE MILES MILLIONS
LAND AREA OF THE EARTH (EXCLUDING POLAR CONTINENTS) 52
TEMPERATURE CONDITIONS PERMIT WHEAT PRODUCTION 41
TEMPERATURE AND MOISTURE CONDITIONS PERMIT WHEAT PRODUCTION 11
TEMPERATURE, MOISTURE AND LAND SURFACE (TOPOGRAPHIC) CONDITIONS PERMIT WHEAT PRODUCTION 7
TEMPERATURE, MOISTURE, LAND SURFACE AND SOIL CONDITIONS PERMIT WHEAT PRODUCTION 5.5
IN WHEAT (AVERAGE 1920-1923) 4.5
After Finch and Baker

The introduction of chemical fertilizers to replace the materials removed from the soil, and the processes of crop rotation and fallowing have helped to conserve and increase the food producing power of the land. The discovery and development of methods of fixation of atmospheric nitrogen, transforming it into compounds which can be directly utilized by plants, has also great possibilities as a factor in securing larger yields per acre due to a more carefully controlled condition of the soil. Hybridization and selection have extended the land areas available for cultivation to an enormous extent.

I shall mention but one more of the factors by which man has been able to increase the quantity and security of his food supply. Preventive medicine as applied to human ills has no more perfect examples of the scientific method of investigation than may be found in some of the work carried out by the bacteriologist and the mycologist in the study of the diseases of domestic animals and plants which are so important in our food supply. The prevention or control of such disease as bovine tuberculosis, Texas fever and swine plague, among animal diseases, or of the mildews, rusts, blights, and the destructive action of many forms of insects has a greater significance than we are accustomed to ascribe to it.



After Finch and Baker

THE World War showed us that the nations of the world fall into two classes with reference to food supply — those which are self-sustaining, and those requiring food in some quantity to be imported from other countries. The only countries producing enough wheat for export are the Argentine, Australia, Bulgaria, Canada, Roumania, Russia, and the United States.

	1897–98 Million Bushels		*1927–28* Million Bushels
United States	510		876
Canada	55		440
Argentina	60		239
Australia	38		109
Russia in Europe	230	All Russia	750

(*Continued on page 488*)

BE A SNOB

Further comments on a recent controversy

By Robert E. Rogers

ON THE evening of Saturday, June 1, I spoke to the senior class of Technology at their last dinner together. I spoke impromptu, and with my usual freedom, letting the chips fall where they might, on "The Necessity of Being a Snob." So far as I knew, there were no reporters present. A senior class dinner is usually of no news value. But there was a reporter present, and a good one, too. The result you probably are all aware of. So far as I can make out I rated the front page for a day or two in most of the newspapers of the United States, as well as editorials, special articles and letters to the press. As one graduate wrote me, "I have never seen M. I. T. mentioned so much since I graduated."

For the past two weeks I have been receiving hundreds of letters. A great many Technology men have thoughtfully written me, enclosing clippings so that I can gauge pretty well the geographical distribution of the story. It is literally nation wide. When the letters began to come the reactions were almost mathematically fifty-fifty of praise and blame. Since then, the letters have swung strongly towards approval, particularly from Technology men, from educators who have sensed exactly what I meant, and from people whose letter-heads, style of writing, and so on, show them to be professional men, employers of labor, men of substance in their community. A surprisingly small number have been downright abusive, profane and indecent, and in those the quality of letter paper, the orthography, and grammar indicate that the writers do not matter.

One reaction is of interest to Technology men. A member of the Boston school committee took occasion to spread himself on the records to the effect that I had disgraced the name of Rogers in violating the principles of the founder of the Institute. A few days later a relative of William Barton Rogers very kindly wrote an open letter setting the gentleman right about President Rogers' antecedents, mode of life and ideals, and assuring him that William Barton Rogers would have approved. Later I learned that the school committeeman was on record as having objected to setting up special classes for brilliant students in the Boston schools, on the ground that in a democracy there was no place for an aristocracy of brains. The entire episode is a perfect comment on what I was trying to say.

The whole controversy centers, of course, around the word snob. In dealing with Institute men I have always found it desirable to be pointed, specific and extreme in my language, on the principle that one makes allowance in shooting at a mark in a high wind. It does no good to look up the dictionary definition of Snob, or that popularized by Thackeray. In America the word Snob in universal popular use means "one who thinks himself better than the average and behaves on that assumption," which means that any appearance of superiority will call forth that epithet from people who know no better.

With that definition in mind I stand by my guns. I want Technology men to remember that each one of them is the sole survivor of one hundred boys who started in the public school system with them and have dropped off. I want them to remember that each one of them represents an enormous amount of money, time, energy and patience spent on him. They should, obviously, represent an intellectual aristocracy.

The American world of the man in the street is increasingly a world of vulgarity and low ideals in speech, manners, taste and ideas. Our magazines, our films, our popular music, our comic strips, our advertisements show that without question. It is very easy to be submerged in that world. And the college man seems almost to make a point of being submerged in that world as completely and quickly as possible, as if he were afraid of being recognized as being in any way different or superior. He gives, only too often, no outward signs of being superior. One is moved to exclaim with Percy Marks, "If you are the cream, God help the skimmed milk!" And if the college men are not the cream of the community, then our educational system has failed.

I said this to a Technology crowd, simply because I know Technology men well enough to say it, and not because a Technology undergraduate crowd *en masse* is noticeably below par in this matter of putting up what I called the "front" of a gentleman. Undergraduate manners in our colleges are getting worse instead of better. There is, in the corridors and classrooms, in the great meetings and elsewhere, a distinct increase in loudness, bad manners, vulgarity and baseness of speech and bearing. I am inclined to think that this is true in our colleges everywhere. I have observed it at Harvard as well, but it affects me more intimately and more painfully at Technology. I am reluctantly forced to the conclusion, however, that at Technology the dormitories are fostering this evil instead of helping to eliminate it. Some of the unpleasant phenomena one notices in recent Technology undergraduate life did not exist when there were no dormitories.

A certain proportion of our men, who go out every year, have literally not the slightest conception of what the word "gentleman" means. The word gentleman does not primarily have to do with goodness of heart, ethics, and the like. A good man, a good citizen, is not necessarily a gentleman. The word gentleman is a matter of manners, taste, and good breeding. A fine engineering mind may be disastrously handicapped by the manners of a rough-neck and a low brow. A less fine mind may be carried to desirable success by the right kind of manners, those that attract influential people. One Harvard sneer at my talk was that you can't make a synthetic gentleman. You can! Harvard does it every day. And it works. I only wish that Technology would get hold of the recipe and try it out.

A TECHNOLOGY DIRIGIBLE

Round Hill Experimental Station to use the Goodyear dirigible "Mayflower" for fog and radio research

By Edward L. Bowles, S.M. '22

SEVERAL years ago Colonel E. H. R. Green made it possible for the Institute to establish on his estate at Round Hill, near South Dartmouth, Mass., a radio communication experimental station which has subsequently been designated as W 1XV. The work of this station has become particularly well known by virtue of its communicational aid during the Vermont flood, during the flight of the *Graf Zeppelin*, and after the sinking of the *Vestris*. It has not only played an active part in such emergencies but it maintained scheduled contact with MacMillan on his Polar expedition, the Byrd Expedition, and the ship *Carnegie*, and in addition has acted as an amateur relay station in communication with an important army station in the Philippines, taking traffic for local families of the soldiers.

Realizing the importance of existing aviation problems and their relations to radio research, Colonel Green decided to alter his estate so that it would in time become an airport second to none, suited to non-commercial work and investigation, and a research station where ideas could be expeditiously tested. The development of this field receives a great impetus with the offer of the Goodyear-Zeppelin Corporation to station at the field and put at the disposal of the Institute the non-rigid dirigible, *Mayflower*, which has recently been christened. This offer by Paul W. Litchfield, '96, President of the Goodyear-Zeppelin Corporation and of our own Alumni Association, is to be definitely consummated, upon the completion of hangar facilities built by Colonel Green and Round Hill airport will boast of its first airship dock. In fact, this will be the first one in New England. Above all, it is to be the sole base of the summer's operations of the Goodyear air-vessel in New York and New England territory. To Colonel Green's enthusiastic cooperation must be attributed the consummation of this project.

Few people are probably cognizant of the extensive equipment and work now observable at Round Hill. To house the operating group of research assistants, the Institute has been tendered the use of a house on Colonel Green's estate, now affectionately known by the research group as the "M. I. T. House." Colonel Green has made it possible for the men to live on the estate the year round, thus being close to the laboratories of which there are now two.

The increased activity this last year made it feasible to begin in a substantial way on the problem of airplane navigation in fog. Realizing the need of basic study, the Institute has been careful to have all work guided with regard to the pure physics underlying various steps. It is believed that the laying of such a solid foundation will lead to consistent and important future progress in such undertakings.

The study of fog, both natural and artificial, has already served to confirm quantitatively certain qualitative results and has led to a closer connection in a practical way of eye sensitivity and light source characteristic. The study is expected to lead to a better knowledge of fog as a medium affecting the propagation of electric and elastic waves of various frequencies, thus shedding light upon the question of propagation of energy through such encumbered space and consequently yielding valuable information on the communication of intelligence through such a composite medium. The ability to communicate intelligence through such a medium coupled with proper control of that intelligence permits the practical consideration of such devices as electric and acoustic altimeters, such problems as code or voice contact, and so on. In other words it is considered important to study the physics suggested in such problems, then practical applications.

In accordance with a project originated two years ago, the Institute will undertake a meteorological program beginning this summer. It is proposed ultimately to maintain a complete weather intelligence station on the estate to be of assistance to itinerant aviators and to bear to the meteorological research work to be undertaken there the same relation as the radio transmitting and receiving station bears to the communications research. The meteorological research program will lead into borderline problems, which work it is hoped will shed additional and new light upon that field of science.

The *Mayflower* of Round Hill will be invaluable in radio investigations above the ground and water. Such investigations as those of energy radiations from antenna, radio-fading as affected by the angle of the receiving point above the ground plane at the transmitter, radio beacon field-patterns and aberrations, and wave propagation associated with composite media such as water and air are only some of the problems which may be attacked with the aid of such a ship.

The coming academic year will find us, among other things, probing deeper into questions of radio wave propagation, fog and its transmissive characteristics, meteorological phenomena, supersonics, and beacon flying, many of which are associated directly or indirectly with the navigation of aircraft in fog. Other aspects of communication will be studied, including the behavior of aerial systems and the problem of frequency standards.

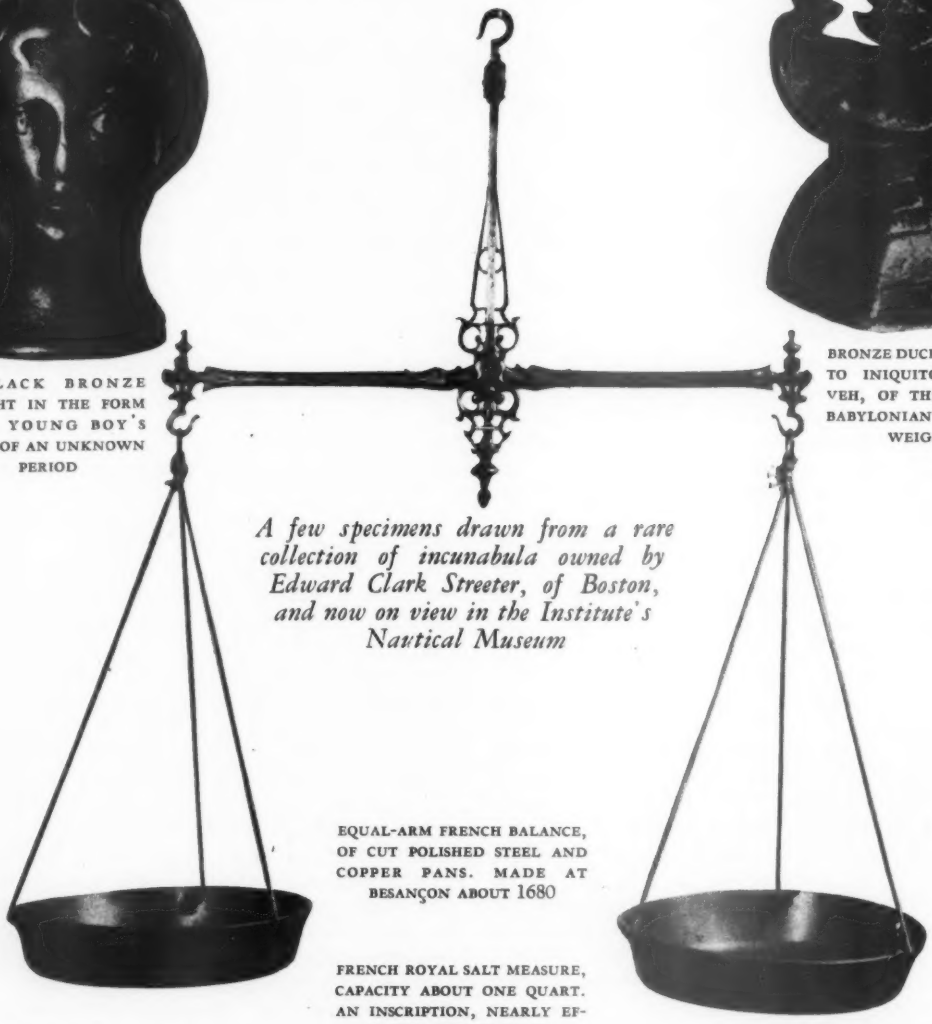
It is a pleasure to pay tribute on behalf of the Institute to Colonel Green for his demonstration of confidence by providing for this expansion of our activities at Round Hill. I may say that the Colonel once remarked that he would feel that this development had been well worth while if the experimental work it made possible resulted in the saving of a single human life.

WEIGHTS AND MEASURES OF ANTIQUITY

A BLACK BRONZE WEIGHT IN THE FORM OF A YOUNG BOY'S HEAD OF AN UNKNOWN PERIOD

BRONZE DUCK CREDITED TO INIQUITOUS NINEVEH, OF THE ASSYRIO-BABYLONIAN SYSTEM OF WEIGHTS

A few specimens drawn from a rare collection of incunabula owned by Edward Clark Streeter, of Boston, and now on view in the Institute's Nautical Museum



EQUAL-ARM FRENCH BALANCE, OF CUT POLISHED STEEL AND COPPER PANS. MADE AT BESANÇON ABOUT 1680

FRENCH ROYAL SALT MEASURE, CAPACITY ABOUT ONE QUART. AN INSCRIPTION, NEARLY EFFACED, ATTESTS TO ITS LEGALITY

ONE OF THE FEW ANGLO-SAXON ROYAL HALF-POUNDS NOT DESTROYED BY QUEEN ELIZABETH

DISC WEIGHT SIX INCHES IN DIAMETER. BELIEVED CAST IN THE ORIENT FOR AN ARABIAN TRADER

BOOKS

The History of Man

EVOLUTION AND MAN, by Hervey Woodburn Shimer. $2.60. 273 pages. Boston: *Ginn and Company*.

THIS new book differs from the many that have been published in that it serves to stress the evolution and relationships of lower organisms largely as a basis upon which to discuss that of man in particular. It emphasizes, moreover, not merely the physical aspect of evolving forms but the dawning and development of consciousness as expressed in them, which has its culmination in mankind.

The several parts discuss the evolution of the organic environment, divergence of plants and animals, and their classification. The evidences of evolution are derived from several sources: paleontology, comparative anatomy, ontogeny, and distribution. There follows, then, a presentation of the causal factors of evolution from within and without the organism, including heredity and parasitism. The background being completed, man is now discussed, his physical evolution, ancestry, early records, and the effect of the environment on his becoming. The four instinctive human impulses prepare the way for man's control of his own evolution, for the evolution of service and the expanding consciousness.

The discussion is logical and clear and shows a thorough familiarity with evolutionary thought and discovery, as well as the clarity of presentation of an experienced teacher. The appendix adds much pertinent information — a history of the concept of evolution, the mentality of our nearest simian relatives, and the sources and interpretation of ethnological data, together with the origin of historic races. A brief reading list completes the volume.

The book is well printed, handy in size, and singularly free from error, factual or otherwise. It should be widely read.

R. S. LULL

The Art of Clokyng a Trouthe With Colour Tenebrous"

MODERN ENGLISH IN THE MAKING, by George H. McKnight and Bert Emsley. $4.00. 590 pages. New York: *D. Appleton and Company*.

DR. McKNIGHT and his collaborator make philology interesting to ordinary folks. They do it by observing the truth that language and life are inseparable, the one a function of the other, and by demonstrating that the English language in particular is not yet fossilized, or even suffering from arteriosclerosis, but instead is still vigorously undergoing mutations and growth, particularly here in ungrammatical America.

In his introduction he sets down his purpose as that of attempting "to show the principal changes that have taken place in the English language since the adoption in the fourteenth century of the East Midland dialect. . . . Effort is made to show the natural tendencies that have affected its growth and at the same time to exhibit the methods employed in its cultivation."

In achieving this purpose in an admirable manner he has incidentally compiled a feast of language lore that ranges from the "finical flaunting phrases and termagant inkhorne terms" of the professors to the bawdy, colorful profanity of the drunks and Falstaffs who have always added, unwittingly though it be, a saving yeastiness to their mother tongue. Consequently both of these classes as well as intervening ones can find conversational sustenance in the book.

Dr. McKnight has probably added little to the archives of the etymologists but he has made these archives available and understandable to people who have no aspirations toward becoming Dr. Syntaxes.

J. R. K., JR.

Bibliomania

THIS BOOK-COLLECTING GAME, by A. Edward Newton. $5.00. 392 pages. Boston: *Little, Brown and Company*.

MR. NEWTON concerns himself chiefly with a résumé of what may be called the mechanics of book collecting. He summarizes the technique behind the making and binding of books, he suggests some possible lines for the collector to follow, he tells something about the traffic in rare volumes, and in a chapter entitled "*Caveat Emptor*" he warns the novice that some books are valuable and that others, apparently identical in every way, are almost worthless as collectors' items. "This Book-Collecting Game" and "The Amenities of Book-Collecting" (Mr. Newton's first book, which we think is a much better piece of writing) are recommended to anyone who thinks that book collecting is of necessity a game for the idle rich. The two supplement each other.

With the exception of the frontispiece, both the illustrations and the text of the present volume were printed on an offset press from plates prepared by the aquatone process. Instead of printing directly from type, engravings, or electrotype plates in the usual way, the offset press planographically transfers to a rubber blanket the inked impression from the aquatone-processed plate, and this rubber blanket is then brought into contact with the paper to which the ink is transferred or "offset." Both outside covers of The Review for the past twenty issues have been printed by an offset process. The object of it all is to make possible the reproduction of photographs and other detailed illustration without resorting to glazed paper. The best papers for text matter — best for the reader's eyes and best for the appearance of the page — have a dull surface upon which halftones cannot well be printed by the usual "letterpress" method. The offset process undoubtedly contributes much to the ease of reading a book in which illustrations and text refer-

ences to them are as numerous as they are in Mr. Newton's book. In addition, a pleasing unity of color and mass is obtained; the illustrations appear to be as much a part of the page as the text.

The contention that "This Book-Collecting Game" "is one of the first commercial books to be printed in this manner" seems to be justified because those done in offset that we have seen have been photographically reproduced from earlier editions, thus saving a part of the cost of composition. This one, apparently, was set in type in the usual way and the plates photographically prepared from proofs. This, with the fact that the life of a set of aquatone plates is limited (the pages in our copy of the book from the second printing are noticeably gray and lack the sharp contrast between white paper and black ink that is essential for easy reading), makes this a likely item with which to break into "This Book-Collecting Game."

Mr. Newton not only knows book-collecting and the people who have become famous at it; he has, in addition, a fund of material for yarn spinning and a flair for writing interestingly. He is not always lucid and not always coherent, in the rhetorical sense, but he always makes pleasant reading with a style that is almost conversational in its amiability. He paints rosy pictures of the hobby and he paints them well. Therein lies the danger, for he is insidiously persuasive. Undoubtedly, he makes many casual readers into addicts who (in the jargon of another day) find that they cannot "either take it or leave it alone."

J. D. C.

Blood and Thunder

BANDITS AND THE SOUTHERN PACIFIC, by C. B. Glasscock. $2.50. 294 pages. New York: *Frederick A. Stokes Company.*

WHEN San Francisco had a population of less than 150,000 and the Sacramento Valley still owed its prosperity to the mining boom, there lay to the south ten million acres of "desolate land, scorched by the sun through long summers . . . roamed by cattle, coyotes, cowboys and vicious remnants of the gold-rush days — that was the San Joaquin Valley of California in the Seventies." Into it came settlers, "the sandlappers," squatters who undertook to farm quarter sections of government land; and to the cattlemen whose unfenced stock roamed the range untended, the sandlappers were quite unwelcome.

Then the Southern Pacific Railroad built their line through the valley, changing its "vague right of way . . . so to touch and seize the rich lands which were just coming into a clear market value under the sweat and labor of the sandlappers and, the more efficient sheep, cattle and wheat growers of the Eighties."

Mr. Glasscock writes of this exciting struggle of the first two of these three elements in the San Joaquin against the railroad whose high-handedness and monopolistic efforts, supported by its control of politicians, banks, newspapers, and courts, made it cordially hated. It is a connected story of train robberies, bandit chasing and prison escapes bearing evidence of painstaking research into newspaper files and careful weighing of statements by participants, some of whom survived the blood shedding and are still alive today. However, the incidents he reports formed the basis of dime novels years ago, and, though Mr. Glasscock, as becomes an historian, is restrained in his style, his chapters usually end something like this, "Before the smoke of that byplay of the manhunt cleared, three more men were to be shot dead and four more wounded."

H. E. L.

Deck Scrubbing and Blackbirding

JOHN CAMERON'S ODYSSEY, transcribed by Andrew Farrell. $4.50. 461 pages. New York: *The Macmillan Company.*

ROBINSON CRUSOE'S adventures were only those of a small boy at play on Saturday afternoon compared with the tales of John Cameron in the Pacific Ocean. Shipwrecks, tornados, and cannibals abound in the pages of his long, hazardous sea voyages among the islands of the Pacific.

As a boy of seventeen, John Cameron left Scotland and its too religious atmosphere to become an apprentice seaman on the bark *Ida*. So strongly had he the call of the sea in his blood that neither overwork, scanty food, nor harsh treatment could spoil his delight in the sea. Conditions for seamen in the Age of Sail were somewhat different from what they are now in this Age of Steam. Water was scarce, usually rain-water, bread was often filled with weevils or maggots, and pork was rancid. On long voyages food often gave out entirely, and sharks or turtles were made to fill the entire bill of fare. Sailing meant the hardest sort of manual work in all sorts of weather. The handling of great sails, painting and deck scrubbing were the order of the day, and hours of relaxation were few. Yet Cameron was a sturdy lad and found much to amuse him despite the monotony of long voyages.

The *Ida* was the first of many ships on which John Cameron fought, drank, and swaggered his way around the Horn and back and forth among the islands of the Pacific. Occasionally the lure of lazy life on tropic islands held him for a short time, but always he returned to the wide blue sea where there was room enough to ride out a gale or weather a tornado. He saw the destructive effects of a friendship with John Barleycorn, yet he continued to drink heavily. Blackbirding, or the business of stealing natives for the slave trade, became his occupation for a time, and this nefarious trade was carried on among unfriendly natives by strategic and not always honorable methods. Aids to navigation were imperfect and the constant danger of wrecks made Cameron able to shift for himself in danger, to make quick decisions, and often to use his fists quickly. In spite of the fact that that he lied, cheated and stole to gain his own ends and was a relentless enemy, he was a good friend and a hardy sailor.

His voyage on the *Wandering Minstrel* and its subsequent wreck on a small island forms one of the most interesting incidents in the book. His own remarkable experiences fade before the story of the unfortunate castaway, Jorgensen, with its chapters of shipwreck, murder, and starvation. In the company of Jorgensen and a "young, fat and tender Chinese boy," Cameron made a dash for civilization in a (*Continued on page 493*)

VISITING COMMITTEE REPORT

Covering the recent meeting of the Visiting Committee for the Department of Naval Architecture and Marine Engineering. Published by arrangement with the Executive Committee of the Corporation

THE Committee * convened on February 2, 1929, at 9 o'clock at Professor James R. Jack's office at the Institute. There were present for the Committee:

A. Farwell Bemis, '93.

Henry A. Morss, '93.

Joseph W. Powell, Chairman.

and for the Institute:

James R. Jack, Professor of Naval Architecture and Marine Engineering, in charge of the Department.

Lawrence B. Chapman, '10, Associate Professor of Ship Operation and Marine Engineering.

Evers Burtner, '15, Assistant Professor of Naval Architecture and Marine Engineering.

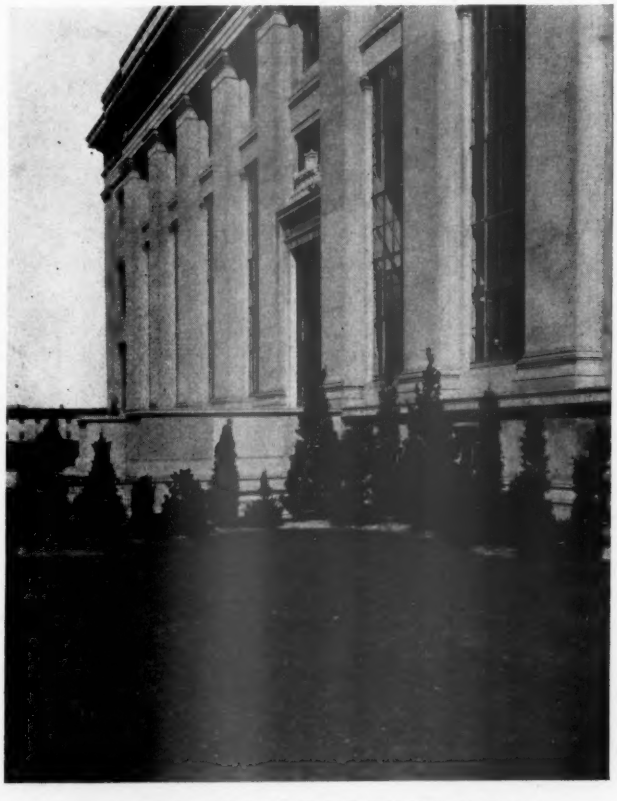
Student Attendance: Professor Jack reported to the Committee that the U. S. Navy is now sending six students per year to the Institute for work in Course XIII-A; that of the commercial students there were in the sophomore class eight in Option 1 and ten in Option 2. All of the students in Option 1 and eight of the ten in Option 2 are making satisfactory progress.

Scholarships: The question of additional scholarships was discussed. The Institute would like an additional scholarship to operate in alternative years with that contributed by the American Bureau of Shipping, in order to have one $500.00 scholarship available each scholastic year. The withdrawal of the Lloyd scholarship will leave Option 1 without this incentive and Professor Jack is anxious that a new one be obtained to replace it. There was discussion as to the advisability of a scholarship for the Doctor's degree. There are numerous possibilities for advanced work, both in the mathematics of ship construction and in the study of general and special designs to meet the requirements of various services. Also the construction of a ship model tank at the Institute would offer many opportunities for valuable contributions to scientific knowledge.

Summer Work: The subject of arrangements desired by the Department to permit students to make a sea cruise was discussed. Professor Jack said that he would not have over two men desiring to go to sea, while Professor Chapman put his maximum figure at four. Stanley Dollar, of the Dollar Steamship Company, has shown interest in providing these facilities.

Work of Graduate Students in Ship Operation: Professor Chapman reported that his first graduate student, Gilbert J. Ackerman, '28, has been placed with the Export Steamship Company and has been with them since September, 1928. They are giving him practical experience in different departments of the Company's business and his progress will be watched with particular interest.

Additional Members of the Advisory Committee: Captain Eugene O'Donnell, who is President of the Eastern Steamship Company, and Edward P. Farley, 11 Broadway, New York, who is Chairman of the American Hawaiian Steamship Company, were suggested as desirable additional members to the Advisory Committee for the Department, and the Chairman was instructed to ask President Stratton to invite them to become members of this Committee. At present there are three members listed as members of the Advisory Committee for Option 1 and thirteen for Option 2. Rear Admiral D. W. Taylor, U.S.N., Washington, D. C., S. W. Wakeman, Vice-President of the Bethlehem Shipbuilding



ENTRANCE TO BUILDING 5, THE PRATT SCHOOL OF NAVAL ARCHITECTURE AND MARINE ENGINEERING

* The complete roster of this Committee is as follows: Charles A. Stone, '88, 49 Federal Street, Boston; A. Farwell Bemis, '93, Box 5173, Boston; Henry A. Morss, '93, 201 Devonshire Street, Boston; Joseph W. Powell, Chairman, 6 Beacon Street, Boston.

ABOVE: STUDENTS WORKING IN THE SHIP MODEL SHOP UNDER THE DIRECTION OF PROFESSOR GEORGE OWEN, '94. BELOW: ENTRANCE TO THE INSTITUTE'S NAVAL MUSEUM

Corporation, Ltd., Quincy, Mass., and J. F. Metten, President of the Marine Engineering Corporation, Fifth and Cherry Streets, Philadelphia, Penna., are proposed as additional members of the Committee for Option 1.

Spring Meeting in New York: The advisability of a spring meeting of the Advisory Committee in New York was discussed. The work of the Course in Ship Operation has advanced to a point where the actual methods pursued and the results obtained can be described to ship operators and it is believed that such a meeting will stimulate their interest and should bring very useful ideas.

Shipping and Shipbuilding on the Ohio and Mississippi: The rapid strides that have been made in marine transportation on our inland waterways were discussed. The Committee suggests that the time and effort required to investigate conditions of shipping and shipbuilding on the Ohio and Mississippi Rivers and other inland waterways, with a view to familiarizing the staff at the Institute with these developments and assuring an outlet to our students with firms engaged in these activities, would be time and money well expended.

Proposed Ship Model Tank: Professor Jack discussed with the Committee the plans of the proposed new ship model tank. He stated that this could be constructed for less than $500,000 and that the President, Dr. Stratton, desired to push this proposal to an early conclusion

as he believed the money could be raised for this new facility. Mr. Bemis wished to suggest a form of construction for the tank which he believes may result in reducing its cost.

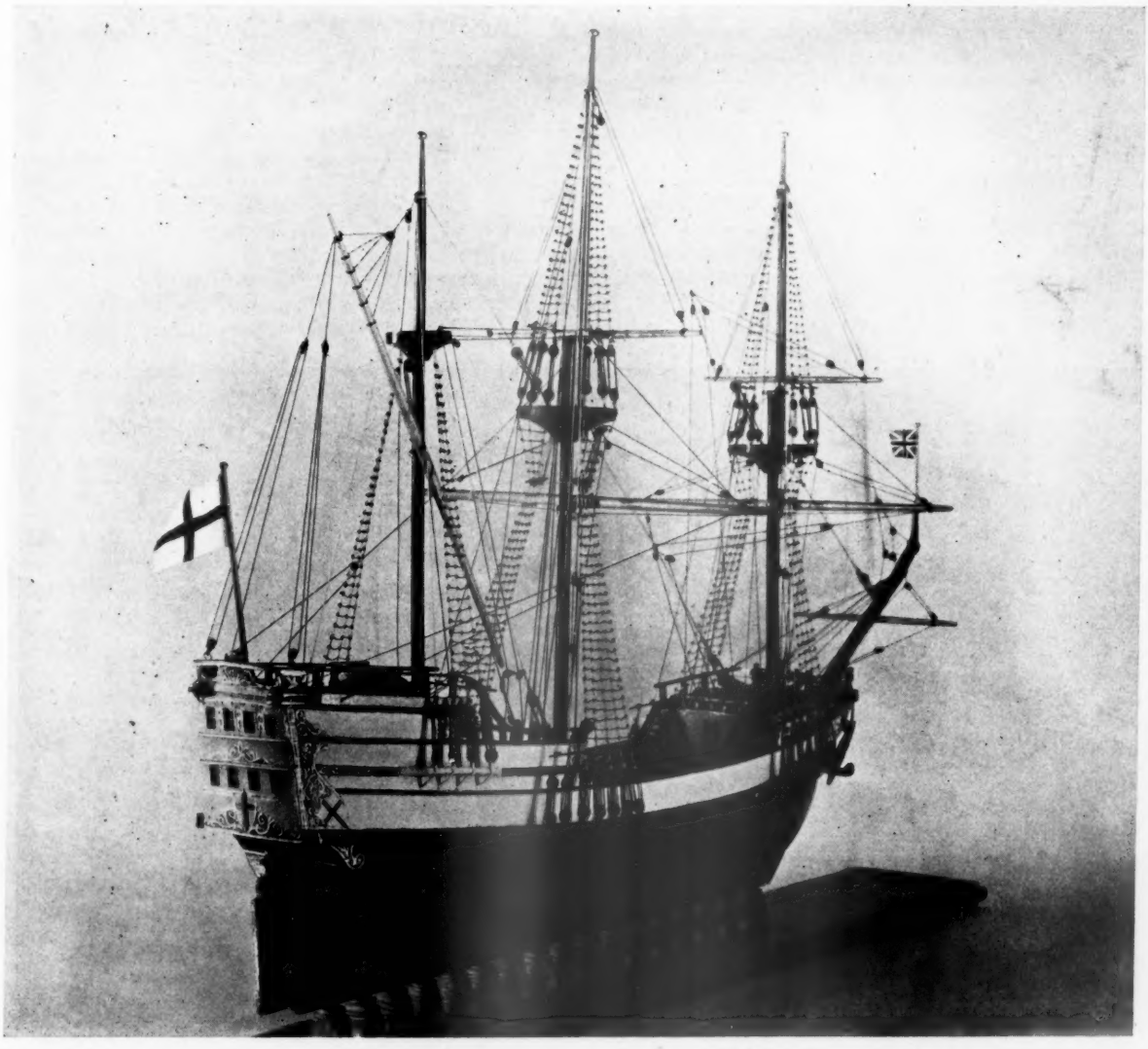
Report of National Industrial Conference Board: Mr. Bemis briefly outlined to the Committee the study of the American Merchant Marine in its relation to National Welfare that is being made by the National Industrial Conference Board. He stated that copies of this report should shortly be available and Professor Jack asked that six copies be furnished for the Department, including one for Dr. Stratton. It was suggested that a copy be forwarded to each member of the Advisory Committee.

Proposed Change in name from "Course in Ship Operation" to "Course in Shipping Administration": Professor Chapman suggested that the present name of the Course over which he presides, *i.e.*, the "Course in Ship Operation," was not descriptive and, in fact, was misleading and that a better name should be found, such as the "Course in Marine Transportation." Mr. Morss suggested the name "Course in Shipping Administration," which appeared to the Committee to be an improvement, and it was suggested that this change in designation be approved by the Executive Committee.

It was further suggested by Professors Jack and Chapman that, instead of designating this Course as "Option 2" in Course XIII, it might be called XIII-C. It will be recalled that Course XIII-A is a special course for Naval Constructors of the U. S. Navy. There is a course carried under the designation of XIII-B for Naval Constructors of foreign countries, but this has been discontinued. It was suggested that consideration be given as to the possibility of dropping Course XIII-B and giving this designation to the "Course in Shipping Administration."

Respectfully submitted,

JOSEPH W. POWELL, *Chairman*



A MODEL, DESIGNED AFTER SHIPS OF THE "MAYFLOWER" PERIOD, BUILT BY PROFESSOR JAMES R. JACK

Commencement

GRADUATION exercises, held this year on June 4 in Symphony Hall, Boston, marked the award of the largest number of graduate honors ever given at the Institute. President Stratton conferred 200 advance degrees including 174 Masters of Science, 9 Masters of Architecture, 6 Doctors of Science, 11 Doctors of Philosophy. In addition to these, 387 Bachelors degrees were conferred and twenty-nine Fellowships and scholarships announced.

The academic procession made colorful by academic insignia of institutions the world over, was led by Dr. Stratton and Chief Marshal Alexander Macomber, '07. Following Dr. Stratton marched Senator Hiram Bingham of Connecticut, the Commencement speaker, and his escort, Associate Professor James L. Tryon. Then came Reverend Samuel A. Eliot, with Colonel Frank L. Locke, '86; Major General Preston Brown, Commander of the First Corps Area with Colonel Harold E. Cloke; Admiral Philip Andrews, Commandant of the Boston Navy Yard, with Professor J. R. Jack; Commander Earl F. Enright, U. S. N., and Professor Charles F. Taylor; and Mayor E. W. Quinn, escorted by Professor J. W. Barker, '16.

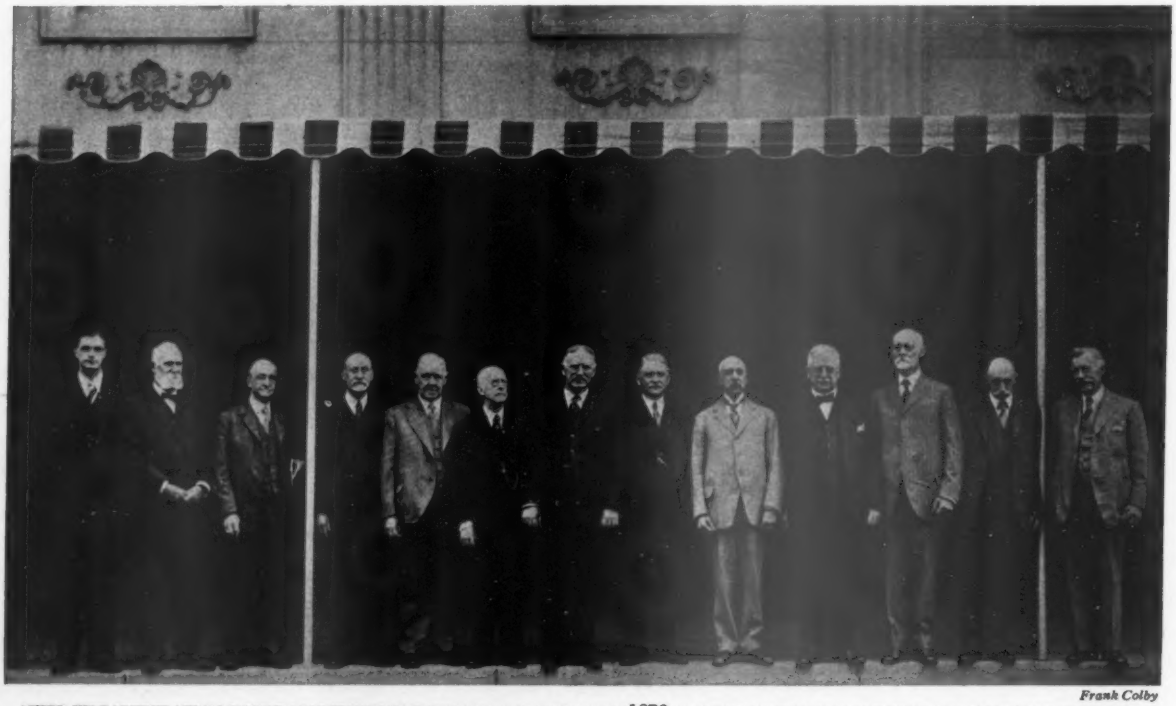
Then came members of the Corporation of the Institute, who had as their marshal Walter Humphreys, '97, newly elected Secretary of the Corporation. Following the custom of other years the Fifty-Year Class, the men who were graduated in 1879, was given a place of honor in the procession, with Professor Samuel C. Prescott, '94, acting as marshal.

Professor George E. Russell, '00, of the Department of Civil and Sanitary Engineering, marched at the head of the Faculty procession. The candidates for degrees were led by C. Brigham Allen, President of the Class of 1929, of New Rochelle, N. Y.

New Corporation Secretary

FOR TWENTY years preceding his death James P. Munroe, '82, the third Editor of The Review, was Secretary of the Corporation, and now Walter Humphreys, '97, his predecessor as Editor of The Review, becomes his successor as Secretary and Life Member.

Since Mr. Munroe's death on February 2, Joseph W. Powell has been Acting Secretary, but at the meeting on May 31, Mr. Humphreys actively assumed the important position to which Mr. Munroe so long lent distinction. At present Secretary-Treasurer of the American Association of Wool Manufacturers, shortly after his graduation in the Department of Mechanical Engineering in 1897, he assumed the post of Registrar at the Institute, and held it for twenty years. He was Editor of The Review for one issue, Number 4 of Volume I, published in 1899. From



Frank Colby

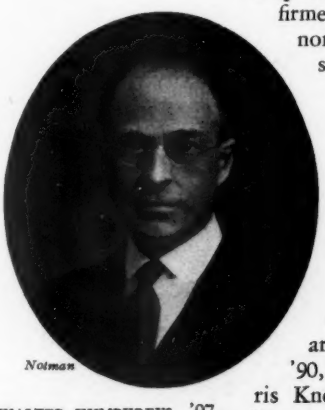
AFTER ITS PARTICIPATION IN THE COMMENCEMENT EXERCISES, THE CLASS OF 1879 WAS THE GUEST OF PRESIDENT STRATTON AT A LUNCHEON. THEY WERE ACCOMPANIED BY C. BRIGHAM ALLEN, PRESIDENT OF THE GRADUATING CLASS

Fairchild Aerial Surveys, Inc.

MOST RECENT VIEW OF THE INSTITUTE PROPERTIES, TAKEN FROM THE WESTERN SIDE

1906–1923 he was Secretary-Treasurer of the Alumni Association; from 1920–1922 Associate Professor of Mechanical Engineering. In addition he served as a Term Member of the Corporation from 1923 to 1928. The Review, together with all of Technology, applauds this appointment of Mr. Humphreys. Few men have devoted themselves as conscientiously to the welfare of the Institute, few are more familiar with its many facets.

In addition to the election of Mr. Humphreys, the Corporation on May 31 also confirmed the election of three nominees to Term Membership on the Corporation: Alexander Macomber, '07, Retiring President of the Alumni Association; Calvin W. Rice, '90, and Maurice R. Scharff, '09, Retiring President of the Technology Clubs Associated. The retiring Term Members are: George L. Gilmore, '90, Lexington, Mass.; Morris Knowles, '91, Pittsburgh, Penna.; and Redfield Proctor, '02, Proctor, Vt. Their terms are for five years.



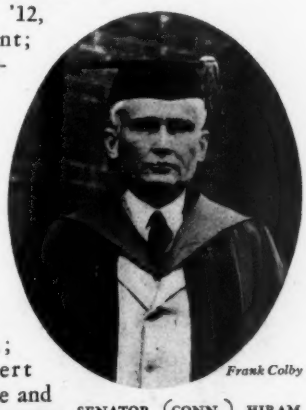
Notman

WALTER HUMPHREYS, '97, THE NEW SECRETARY AND LIFE MEMBER OF THE CORPORATION

Faculty Appointments and Resignations

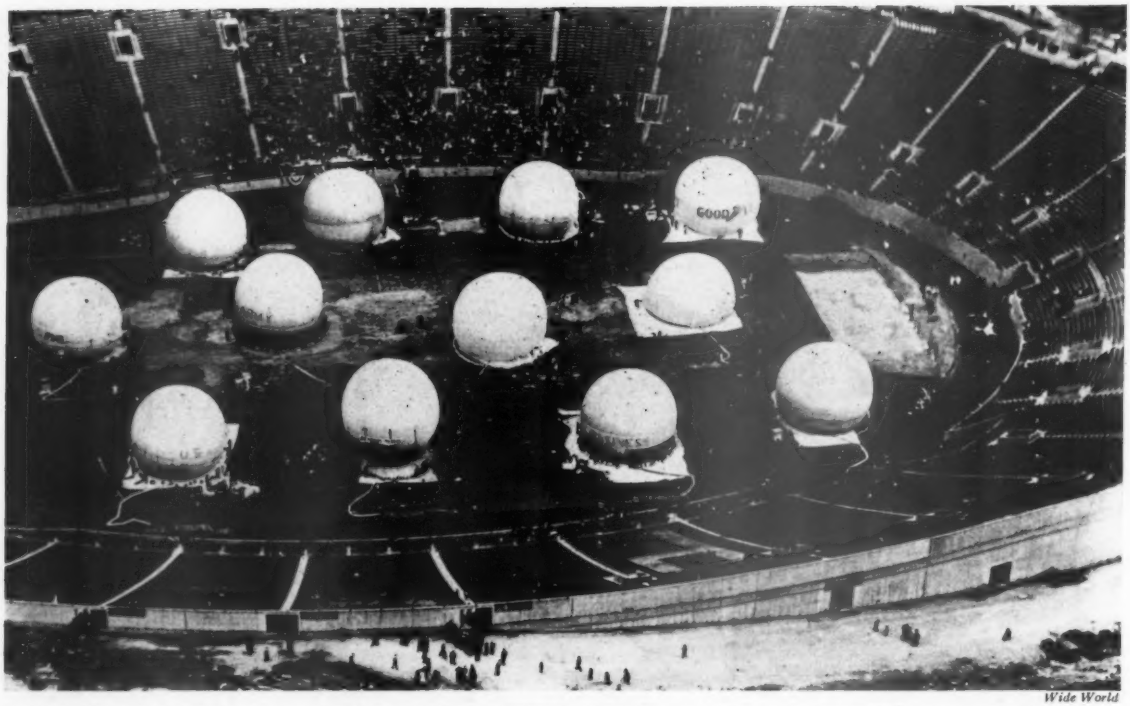
THE LIST of promotions among the Faculty confirmed by the Corporation on May 31 includes the names of nine Associate Professors who have been promoted to the grade of Professor: Lawrence B. Chapman, '10, Ship Operation and Marine Engineering; Ralph G. Hudson, '07, Electrical Engineering; Frank L. Hitchcock, Mathematics; Waldo V. Lyon, '05, Electrical Machinery; Earl B. Millard, Theoretical Chemistry; Erwin H. Schell, '12, Business Management; Henry L. Seaver, English; George W. Swett, '03, Machine Design; and Charles F. Taylor, Aeronautical Engineering.

The following were advanced to the grade of Associate Professor: James A. Beattie, '17 Physico-Chemical Research; Lieutenant-Colonel Robert C. Eddy, Military Science and Tactics; Karl D. Fernstrom, '10, Business Management; Victor O. Homerberg, '21,



Frank Colby

SENATOR (CONN.) HIRAM BINGHAM, SPEAKER AT GRADUATION ON AVIATION'S FUTURE



Wide World

BALLOONS IN PITT STADIUM, BEFORE THE START OF THE NATIONAL ELIMINATION RACES, HELD ON MAY 4, DURING THE MEETING OF THE TECHNOLOGY CLUBS ASSOCIATED IN PITTSBURGH

Physical Metallurgy; Henry O. Forrest, '20, Chemical Engineering and Director of the Research Laboratory of Applied Chemistry; Per K. Frolich, '23, Chemical Engineering and Assistant Director of the Research Laboratory of Applied Chemistry; Murray P. Horwood, '16, Biology and Public Health; Frederick K. Morris, Geology; Winward Prescott, English; and Norbert Wiener, Mathematics. Promotions from Instructor to the grade of Assistant Professor follow: Murray F. Gardner, '24, Electrical Engineering; Louis Harris, '20, Chemistry; Ernest H. Huntress, '20, Chemistry; Frederick H. Norton, '18, Ceramics; Kenneth C. Reynolds, Hydraulics; Lepine H. Rice, Mathematics; Daniel C. Sayre, '28, Aeronautical Engineering; Francis W. Sears, '20, Physics; George V. Slottman, Chemical Engineering; Leighton B. Smith, '19, Physical Chemistry Research; Edward S. Taylor, '24, Aeronautical Engineering; Arthur L. Townsend, '13, Machine Design; Henry W. Underwood, Jr., Chemistry; John H. Zimmerman, '23, Materials of Engineering.

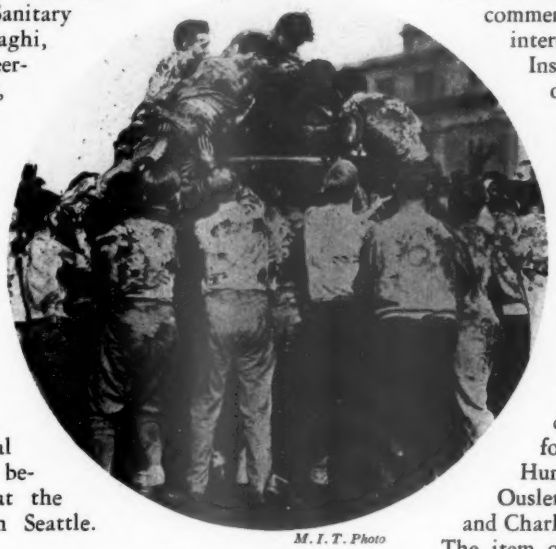
Two resignations from the Department of Aeronautical Engineering have been announced. Professor Edward P. Warner, '17, Head of the Department and former Assistant Secretary of the Navy for Aeronautics, resigns to enter business. He served on the staff of the Institute since his graduation in 1917. In 1926 he was given leave of absence to act as Assistant Secretary of the Navy for Aeronautics. Professor Charles H. Chatfield, '14, who has been Acting Head of the Department during Professor Warner's absence in Washington also resigns now to join the Pratt and Whitney Company of Hartford, Conn., as

CHARLES P. ROCKWOOD, '01, AND C. LAUREN MALTBY, '22, OF THE TECHNOLOGY CLUB OF CHICAGO ARRIVING IN PITTSBURGH AND BEING GREETED BY MAURICE R. SCHARFF, '09, AFTER THEY HAD FOUGHT WIND AND RAIN TO REACH THE T. C. A. CONVENTION

an aeronautical engineer. He was graduated from the Institute in 1914 and received his Master's degree in 1915 and has been on the staff at Technology since 1926.

Professor Joseph W. Barker, '16, Associate Professor of Electrical Engineering since 1925 and one of the most prominent of the younger members of the Faculty, leaves the Institute to become Head of the Department of Electrical Engineering at Lehigh University.

From the Department of Economics and Statistics goes Willard E. Freeland, since 1922 Assistant Professor of Marketing. Associate Professor Edward Mueller has resigned from the Department of Chemistry where he has been teaching inorganic chemistry and thermochemistry since 1911. Dr. Mueller studied at Purdue, Harvard, and the University of Heidelberg before coming to the Institute. The two resignations from the Department of Civil and Sanitary Engineering are Charles Terzaghi, Professor of Foundation Engineering, and Richard G. Tyler, '10, Professor of Sanitary Engineering. Professor Terzaghi came from Robert College in Constantinople in 1926 and has been carrying on research in soil mechanics. He now goes to Vienna by way of Japan and the World Engineering Congress. Professor Tyler returned to the Institute in 1923 having been Dean of Engineering at the Oklahoma Agricultural and Mechanical College. He now leaves to become Dean of Engineering at the University of Washington in Seattle.



M. I. T. Photo

"TECHNIQUE" RUSH, THIS YEAR HELD DURING THE OPEN HOUSE CELEBRATION, APRIL 27

T. C. A. Convention

UNSTINTED were the tributes and praise accorded the God of Aviation at the Convention of the Technology Clubs Associated in Pittsburgh, on May 3 and 4. Many of his high priests and zealots had been drawn to Pittsburgh because of the National Elimination Balloon Races, and a majority of these accepted the invitation of President Maurice R. Scharff, '09, to join with the Clubs in a feast of reason and a flow of soul.

At the banquet on Friday night at the Schenley Hotel, a carefully prepared program was presented and broadcast over KDKA. Lester D. Gardner, '98, acted as toastmaster and presented for three-minute speeches Mr. Scharff; Dr. Stratton; Major General James E. Fechet, Chief of the Army Air Corps; William P. MacCracken, Jr., Assistant Secretary of Commerce for Aeronautics; Lieutenant Commander Charles E. Rosendahl, former commander of the dirigible *Los Angeles;* Paul W. Litchfield, '96, President of the Goodyear-Zeppelin Corporation; Commander J. H. Towers, the Bureau of Aeronautics.

In addition to this radio program, several scientific demonstrations were presented. Dr. S. M. Kintner of the Westinghouse Electric and Manufacturing Company, exhibited a traffic signal device operated by the sound of a horn, an automatic switch for airports which turns on the field floodlights when it is affected by the noise of an approaching airplane, and the transmission of sound over a beam of light. By special arrangements with the Bell Telephone Company, Mr. Scharff held amplified telephone conversation with Francis J. Chesterman, '05, President of the Technology Club of Western Pennsylvania, and Frank B. Jewett, '03, Term Member of the Corporation, both of whom were at Hot Springs, West Va. Dancing followed the banquet.

At the business meeting Saturday morning, President Stratton spoke at length about the Institute, President Macomber about the Alumni Association, and William W. Vicinus, '23, representing the Technology Club of Rochester, showed with critical comments a film used by that Club to interest high school students in the Institute. After the presentation of this film there was complete agreement among all present that the Institute should have a worthy film, and President Stratton assured the meeting that steps would be taken to prepare one.

The report of the Executive Committee, nominating the following officers for the ensuing year, was heard and accepted: for President, George K. Burgess, '98; for Vice-Presidents, Jerome C. Hunsaker, S.M. '12, George W. Ousler, '16, C. Lauren Maltby, '22, and Charles W. Loomis, '16.

The item on the program for Saturday afternoon was the trip to the Pitt Stadium to witness the start of the balloon races. Again the weather interfered, and the start scheduled for early afternoon did not materialize until almost dark. It might be remarked that the actual adjournment of the convention came the next week in the wilds of New Hampshire upon the descent of the winning balloon, the *Detroit Times* entry.

Of the several groups that had planned to come by airplane, only one braved the inclement weather. Charles P. Rockwood, '01, and C. Lauren Maltby, '22, of the Technology Club of Chicago arrived in time for the banquet in a plane fittingly garnished as shown on Page 476. There were approximately 150 out-of-town Technology guests at the Convention.

Progress

POUGHKEEPSIE'S regatta, annually the cynosure of American rowing interest, this year has its initial Technology entries. Its races come on June 24 and their results will be known before this number of The Review is in circulation, but neither of the two Institute crews is expected to win, or even placed second. The varsity hopes to make a decent showing and reflect credit upon the

progress of Technology rowing since its real start with little more than a river some eight years ago; the freshmen are sacrificing several weeks of vacation time and are entering purely as a sporting proposition. They are paying all their own expenses. In spite of a consistently poor season in which they lost every race, they have shown a steady improvement culminating in a close race with the Columbia freshmen, regarded as the best of the young crews in the East.

Nor has the showing of the varsity been impressive in the matter of victories. Aside from the early upset at Annapolis (the first defeat of a Navy varsity crew by Technology) and a second place, Harvard being third, in a triangular competition which Cornell won, the varsity lost to Princeton by a small margin and was beaten badly by Columbia. These, however, were all short races of not over a mile and three-quarters. On the Hudson the distances are to be four miles. Like other sports, the idea of rowing at Technology is not solely to produce winning crews but rather to interest increasing numbers of undergraduates in the value of pursuing some wholesome form of athletic exercise. Whatever the outcome at Poughkeepsie (and we hope it will be far beyond expectations) the lasting merit of the 1929 rowing season, for which Coach Haines is primarily responsible, will rest upon the increased number of men following the sport. This year nearly 150 "worked out" at the boat-house and the equipment was operated to capacity.

Including those interested in rowing it may be conservatively said that one out of every three (or better) undergraduates has, during 1928–1929, participated in active competition for some varsity or intramural team. There are sixteen of the former and nearly one hundred of the latter. Provisional recognition was given to a pony polo team a year ago and lately similar courtesies have been extended by the Advisory Council on Athletics to lacrosse and squash racquets.

Next to rowing, track and cross country continue to interest the greatest numbers, but the more specialized sports are not denied places on the program. Soccer, together with fencing, provides a form of exercise appealing especially to foreign students and it is included. Outstanding among the "specialized sports" during 1928–1929 have been the basketball team which has shown a very high percentage of victories in an active season, the gym team with the best record ever made by an Institute team in this sport, and the swimming team with five individuals and two relay teams breaking existing Institute records.

Encouragement to all athletic activity has been given by the construction work now underway on the Institute land west of Massachusetts Avenue. There are to be a new baseball diamond, and new soccer and lacrosse fields.

Council Meetings

FARM RELIEF is hardly more vexing to the National Congress than the drafting of a new method for the nomination of Corporation Term Members is to the Alumni Council. The comparison is not too far-fetched: both the bodies have before them prickly problems, both have debated heavily and both find satisfactory solutions elusive.

Dr. Allan W. Rowe, '01, in cadenced speech replete with antithesis, paronomasia, and translacing, first enunciated before the Council the difficulties inherent in the present method for nominating Term Members by the apathetic balloting of a few Alumni. It was apparent that something must be done, and forthwith a committee was appointed to frame a new plan that would make for better selection and remove the rankling sting of public political defeat that each year must be suffered by six men under the present plan, and that each year deters other men from running. The Committee duly framed a new plan, a representative electoral college, to suggest many names and finally to vote for three out of nine names presented by the Nominating Committee.

The Council demurred; representatives of local associations voiced resentment that their far-flung groups should be denied a voice and that politically disinterested Alumni should be disenfranchised. The plan was recommitted to the committee for revision, the committee ingeniously revised, and in April at the 139th Meeting of the Council presented a compromise of such consummate legislative legerdemain that it succeeded in bringing Hamiltonian Federalism in beautiful consonance with Jeffersonian Democracy.

The Council seemed pleased, in fact, seemed won, although it could not express itself by vote until five months later. The plan certainly was tacitly accepted; not even at the Convention of the Technology Clubs Associated in Pittsburgh, on May 3 and 4, did anticipated objection follow President Macomber's presentation of the compromise. At any rate, the April meeting resigned itself to the Committee's proposals and passed on to Professor Samuel C. Prescott's ['94] description of his Department's new course in Public Health Engineering, and thence to Assistant (now Associate) Professor Frederick K. Morris's scholarly tales of myth and superstition in Central Asia. The latter was the evening's night-cap and after it the thirty-eight legislators went home to bed.

Twenty-eight days later, on May 27, the same number appeared again in Walker Memorial for the 140th and Annual Meeting of the Council, this time not to argue over Term Membership Selection (it was not even mentioned on the floor) but to listen to fourteen reports from Council officers and committees and to elect by ballot three new members to the all-important Nominating Committee.

The following were chosen for the three vacancies on the Nominating Committee for terms of three years: Harry J. Carlson, '92; Harold B. Richmond, '14; and Frederick Bernard, '17. Gleanings from the fourteen reports include the following facts: the number of dues collected by The Review for this year total approximately 7,325, more than 500 above last year's record; Tech Show this year realized a profit of $1,100.00 contrasted to last year's loss of $1,600.00; the Alumni Dormitory Fund now totals $496,455.40; the total annual expenditure $50,000.00 for Technology athletics is $25,000.00 less than the Harvard University spends for crew alone; for the first time in seven years the expenditures of the Association have not exceeded its income from dues.

The Nominating Committee announced the following appointments: to replace Francis R. Hart, '89, on the Committee on Permanent Funds, Edward L. Moreland,

'07; to replace Edward L. Moreland, '07, on the Committee on Assemblies, Raymond S. Stevens, '17; to fill the vacancy created by the death of James P. Munroe, '82, Professor Robert P. Bigelow. The Special Committee to Nominate Members for the Advisory Councils submitted the following nominations: on the Advisory Council on Athletics, Henry E. Worcester, '97, and Avery H. Stanton, '25; on the Advisory Council on Tech Show, Eric F. Hodgins, '22; on the Advisory Council on the Boat House, Horace S. Ford, Bursar; on the Advisory Council on Walker Memorial, Henry B. Shepard, '16; on the Advisory Council on the Musical Clubs, D. G. Robbins, '07.

The meeting closed at nine o'clock, the shortest annual meeting on record, leaving until next fall, as perforce it must, the still prickly problem of a revised plan for selecting Corporation Term Members.

Technology Dinner Plates

A PLAN for taking Technology into the home was recently launched when the Alumni Association underwrote the design and production of a limited number of sets of pictorial dinner plates. These plates, twelve to the set, each plate having a different view of the Institute in the center, are to be of the famous Wedgwood pottery, made at Etruria, Stoke-on-Trent, England, by the descendants of the great Josiah Wedgwood.

Initial plans contemplated the production of only a few sets for distribution to persons interested in rare china, but it subsequently became apparent that a set of plates, properly executed and reasonably priced, would have a very wide appeal among Institute Alumni at large. Informed of this, the local importer of the Josiah Wedgwood and Sons, Ltd., submitted a plan that has made it possible to respond to this appeal by placing on sale a larger number of sets at a resultingly lower price.

In accordance with the submitted plan, it will be possible, if 500 orders are received, to produce and sell the sets containing twelve plates each at a price of $13 per set, or $25 for two sets, including packing and postage. The first 225 orders received from members of the Alumni Association in good standing will be filled at no extra cost, by sets bearing the autograph of President Stratton. This autographed edition will be strictly limited and at the completion of the stated edition the autographed engraving will be destroyed. A deposit of $4.00 per set is required with all orders, and the remaining $9.00 per set will be due when the plates are ready for delivery next spring.

Notman

JOHN O. HOLDEN, '24, NEWLY APPOINTED ALUMNI SECRETARY. HE ASSUMES OFFICE JULY 1

The plates are standard dinner-plate size, 10¼ inches in diameter, weighing 20 ounces. Designed by Wedgwood and limited in America to Technology plates, the border is characterized by an exquisite formalism in character with the Institute views to be reproduced in the center. Both the border design and the center pictures are reproduced in Staffordshire blue on a white background. The plates may be correctly used either as dinner or place plates, and in addition may serve effectively in a purely decorative capacity.

Every plate will bear on its reverse the name of the Institute, the year 1930, the name of the building represented on the obverse side, and the Wedgwood mark. As The Review goes to press the limited edition has practically been taken.

Alumni Secretary

THE REVIEW is happy to announce in behalf of the Executive Committee of the Association the appointment of John O. Holden, '24, as Alumni Secretary, his term of office to begin July 1. Since the resignation of Orville B. Denison, '11, one year ago, the work of the Association has been temporarily conducted by members of The Review staff. The appointment of Mr. Holden brings to an end this "interregnum" and the Association once again proceeds fully manned.

It was the purpose of the Executive Committee in selecting a new Secretary to obtain a man familiar with the affairs of the Institute whose business affiliations permitted him to carry the Association's work on a part-time basis. Mr. Holden fills this prescription admirably. The year following his graduation he was an assistant in the Department of Economics and throughout he has done valuable work as a member of the Alumni Council, of the Committee on Assemblies, and as Course XV Secretary for his Class. At the present time he is in the Boston sales office of the Detroit Steel Products Company. The Review solicits for the new Secretary the cooperation and support of all Technology men. With that backing he will go far toward making the Association an increasingly efficient adjunct of the Institute.

As reported at the Alumni Council meeting in May, the Secretaryship and Treasurership of the Association will henceforth be divorced. The latter will be in the hands of J. R. Killian, Jr., '26, Managing Editor of The Review and this past year Acting Secretary-Treasurer. During the year just closing the collection of dues has been a function of the Circulation Department of The Review and this arrangement is to continue in the future.

ADVERSARIA

Bays and Laurels: Hydraulics

JOHN R. FREEMAN, '76, Life Member of the Corporation, Past President of two national engineering societies, sometime consulting engineer to the Isthmian Canal Commission and to the governments of Canada and China, and at the present time vigorous opponent of the Jadwin Mississippi flood control plan, adds to previous distinctions that of *honorary fellowship* from the Polytechnic Institute of Karlsruhe. His new honor is bestowed in "recognition of his pioneer activities as a many-sided engineer in prominent scientific research and his services for the international promotion of hydraulic systems."

Bays and Laurels: Art and Architecture

Five Alumni of the Department of Architecture take front rank in recent competitions. They are:

¶ SIDNEY B. WAUGH, '27, winner of the coveted *Prix de Rome* in sculpture for his "Steel", pictured in an adjoining column. For three years under the tutorial direction of M. Henri Bouchard, Parisian sculptor, his career had already been marked by a first mention in the Paris Salon and by his war memorial for Kemmel, Belgium. The value of a *Prix de Rome* approximates $8,000.

SIDNEY B. WAUGH, '27, AND HIS SCULPTURE "STEEL", WHICH WON FOR HIM A "PRIX DE ROME"

¶ CHARLES ST. GEORGE POPE, '27, of the office of RAYMOND HOOD, '03, winner of the Forty-fourth Rotch Traveling Scholarship in Architecture, yielding him $2,000 for two years of foreign study.

¶ DONALD S. NELSON, '26, and WILL R. AMON, '23, two of four Americans remaining in the competition for the Columbus Memorial Lighthouse to be erected on the site in Santo Domingo where Columbus is supposed to have landed. Mr. Nelson two years ago won the Paris Prize and since has been associated on the plans for the Exposition in Chicago; Mr. Amon won the 1925 prize given by the school of Beaux Arts at Fontainebleau and last year the Le Brun Traveling Fellowship.

Bequests

¶ KATIE M. A. GRIMMONS, mother of JOHN A. GRIMMONS, '21, accidentally electrocuted at the Malden and Melrose Electric Company in 1924, has willed to the Institute a trust fund equivalent to one-half the residue of her estate. Its income is to be paid during his lifetime to her remaining son and upon his death is to be available for scholarships, preferably for students in electrical engineering. The principal of the fund is estimated to be $150,000.

¶ CHARLES W. GOODALE, '75, whose death occurred on April 11, bequeathed the sum of $50,000 to the Institute with the expressed desire that it be used for dormitories. Members of the Alumni Council, first hearing of this, also heard that he had contributed the donations of the Class of 1868 to the Dormitory Fund.

Elections

Important posts vacated through death, resignation, retirement, or otherwise are to be filled through election as follows:

¶ WALTER HUMPHREYS, '97, becomes a Life Member of the Corporation and succeeds, as its Secretary, the late JAMES PHINNEY MUNROE, '82. (See page 476.)

¶ SAMUEL C. PRESCOTT, '94, Professor of Industrial Biology and Public Health, is chosen by the Faculty to be its Chairman for 1929–1930. He replaces CHARLES L. NORTON, '93, Professor of Industrial Physics and Head of the Department of Physics, incumbent of the chairmanship during the past two years, the customary term.

¶ ALEXANDER MACOMBER, '07, MAURICE R. SCHARFF, '09, and CALVIN RICE, '90, nominated by the Alumni as Term Members of the Corporation, have been formally elected to office. They replace GEORGE L. GILMORE, '90, MORRIS KNOWLES, '91, and REDFIELD PROCTOR, '02, who have completed the five-year terms.

¶ WILLIAM E. WICKENDEN, director of the study of technical education conducted by the Society for the Promotion of Engineering Education and, from 1909 to 1918 a member of the Technology Faculty, is named President of the Case School of Applied Science.

¶ WILLIAM HOVGAARD, Professor of Naval Design and Construction, has been made a member of the National Academy of Sciences.

¶ JAMES A. BEATTIE, '17, Associate Professor of Physico-Chemical Research, has been made a fellow of the American Academy of Arts and Sciences.

¶ HAROLD B. RICHMOND, '14, Treasurer of the General Radio Company, has been elected President of the Radio Manufacturers' Association.

THE COMMITTEE OF AMERICANS WHICH REORGANIZED THE FINANCES OF THE DOMINICAN REPUBLIC. THEODORE W. ROBINSON, '84, STANDS TO THE LEFT AND REAR OF AMBASSADOR DAWES

Reelections

¶ ALLYNE L. MERRILL, '85, Professor of Mechanism, to whom was dedicated *Technique 1929*, by unanimous vote continues as Secretary of the Faculty. It will be his twenty-fourth term.

¶ Among those continuing in office in the American Academy of Arts and Sciences are: EDWIN B. WILSON, Professor of Vital Statistics in the Harvard School of Public Health and quondam Head of the Department of Physics at Technology, as President; HARRY M. GOODWIN, '90, Dean of Graduate Students and Professor of Physical and Electro-Chemistry, as librarian; ROBERT P. BIGELOW, Professor of Biology and Parasitology, as corresponding secretary; WILLIAM S. FRANKLIN, who retires this year from the Institute's Faculty as Professor of Physics, as editor; INGERSOLL BOWDITCH, '00, as treasurer.

Retirements

Two members of the Faculty, both born in October, 1863, become inactive as of the close of the academic year 1928–29:

¶ DANA P. BARTLETT, '86, Professor of Mathematics, after forty-three years of service.

¶ WILLIAM S. FRANKLIN, for twelve years Professor of Physics and previously a member of the faculty of Lehigh University.

¶ Likewise IDA DAYTON LORING relinquishes her post of Librarian of the Department of Architecture. Her twenty-seven years of service began in 1902.

Other current retirements include:

¶ ARTHUR D. LITTLE, '85, as President of the British Society of Chemical Industry, at its annual general meeting in Manchester, England, this month.

¶ Rear Admiral CHARLES MORRIS, '96, Paymaster General of the United States Navy since 1925; at his own request from the Navy. Grandson of Charles Morris, executive officer of the U.S.S. *Constitution* in her victorious engagement with H.M.S. *Guerrière*, Admiral Morris entered the Pay Corps of the Navy at the opening of the Spanish-American War. He was aboard the U.S.S. *New York* during the engagement off Santiago on July 3 and 4, 1898, and on the July 18 following was aboard the U.S.S. *Hist* at the bombardment of Manzanillo. In 1904 he survived the disastrous explosion on the U.S.S. *Bennington* in the Pacific. During the World War he was Paymaster of the fleet.

WILLIAM H. BASSETT, WHO DIED ON MAY 16, 1929. HE WAS HEAD OF THE DIVISION OF MUNICIPAL AND INDUSTRIAL RESEARCH

Appointments

In the Faculty there are to be nine new Professors, ten new Associate Professors, and fourteen new Assistant Professors. (See page 475.)

Other current appointments are:

¶ EDWARD P. WARNER, '17, former Professor of Aeronautical Engineering, Assistant Secretary of the Navy for Aeronautics under the Coolidge Administration; to membership in the National Advisory Committee for Aeronautics for which, in 1919–1920, he was chief physicist.

¶ EDGAR L. KAULA, '16, author of Tech Show 1914, "A Royal Johnnie"; as Managing Director for The Texas Company in New Zealand.

¶ CARROLL H. SHAW, '10, as general superintendent of the transmission and distribution department of the New York Edison Company.

¶ JAMES E. WALLIS JR., '17, and FRED C. SOMMER, '25, as American Trade Commissioners at Berlin and Riga, respectively. The former, a Captain of Coast Artillery in the World War, received the Distinguished Service Cross and an Army Citation for Valor. Subsequently he represented the Sullivan Machinery Company in Asia. The latter's territory will cover the Baltic Republics of Esthonia, Latvia and Lithuania, and be a listening post on Russia.

¶ GORDON M. FAIR, '16, as Associate Professor of Sanitary Engineering in the Harvard Engineering School.

¶ LOUIS S. CATES, '02, as President of the National Copper Bank of Salt Lake City.

Predictions

Peering into their private horoscopes the following men foresee the following developments:

¶ PAUL W. LITCHFIELD, '96, President of the Goodyear-Zeppelin Corporation, and the Alumni Association: a commercial airship service to Hawaii.

¶ THOMAS A. JAGGAR, from 1902 to 1917 Head of the Department of Geology: an eruption of Mauna Loa "sometime within eighteen months."

¶ JOHNSON O'CONNOR, industrial and vocational psychologist with the General Electric Company and lecturer on that subject at the Institute: a number language. "A group of bankers and scientists cooperating with one another might so formulate numbers into a simple language that they could be handled with two-thirds the present effort."

In Partibus Infidelium

¶ Engineering in Russia has drawn two men: JOSEPH P. FISH, '12, electrical engineer for the Hugh L. Cooper and Company, is at work upon the *Dnieperprostroi*, an 800,000 horse power hydroelectric development under construction by the United Socialist Soviet Republics. FRANK CHASE, '01, is busying himself with the design of Soviet founderies.

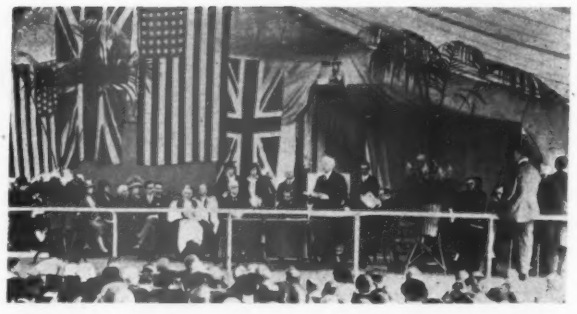
Record Holders

¶ JOSEPH L. LEVIS, '26, first American to place in the Foils finals of the Olympic Games, holder of the National Three Weapon Championship, has now reached an apogee of swordsmanship by winning the Foils Championship of America.

¶ Lt. EDWARD W. ROUNDS, '17, U.S.N., one-time (1916–1917) Captain of the Technology Varsity Wrestling Team, on May 25 won second place in the Annual Navy and Marine Corps Seaplane races.

Donor

¶ GEORGE EASTMAN, Life Member of the Corporation, has given to the poor of London a million dollar dental clinic and to the Association of American Rhodes Scholars $200,000 to establish a George Eastman visiting professorship at Oxford.



GEORGE EASTMAN, LIFE MEMBER OF THE CORPORATION, AT THE DEDICATION OF THE DENTAL CLINIC HE DONATED THE LONDON POOR

Deaths

Since the last issue, reports have come to The Review of the decease of the following:

¶ HENRY M. LANE, '73, on May 15, 1929. His death in the explosion at the Crile Clinic in Cleveland ended an engineering career made notable by the designing and building of the first cog railroad on Pike's Peak.

¶ HARRY M. BOON, '83, on December 8, 1928. He was affiliated with the Babcock and Wilcox office in Chicago.

¶ SAMUEL P. POLAND, '84, on January 20, 1928, at San José, Calif.

¶ ELEAZER B. HOMER, '85, on February 12, 1929. A former instructor in Architectural History at the Institute and a member of the architectural firm of Clark, Howe, and Homer. He later maintained an office of his own.

THEODOR REHBOCK, PROFESSOR OF HYDRAULICS AT THE TECHNICAL UNIVERSITY OF KARLSRUHE, AND LECTURER AT THE INSTITUTE

¶ HENRY W. BLAKE, '88, on May 20, 1929. Lecturer from 1890–91 at the Institute on the Construction and Application of Electromotors and since 1908 editor of the *Electric Railway Journal*.

¶ HARRISON G. DYAR, '89, on January 21, 1929. A research student in the field of Lepidoptera investigation.

¶ GEORGE H. WETHERBEE, JR., '89, on February 4, 1929. A partner of the civil engineering firm of White and Wetherbee of Braintree and Boston.

¶ WILLIAM I. PALMER, '91, on April 14, 1929, in Winchester, Mass. Treasurer of Palmer and Parker, mahogany importers and manufacturers.

¶ RALEIGH B. ADAMS, '94, on April 14, 1929, after an accident and an operation. A manufacturer of belting and other products made from rubber.

¶ HENRY F. RIPLEY, '94, on May 30, 1929, at Hingham, Mass. A representative of his district in the state Senate.

¶ FRANK B. SHERMAN, '95, in April, 1929, in Terre Haute, Ind. Engaged in the bond business.

¶ LANE JOHNSON, '99, on March 2, 1929, at Ingram, Penna. A mechanical engineer for various steel plants.

¶ WINFRED F. ROBERTSON, '03, on February 18, 1929, in Los Angeles, Calif. A paper manufacturer of Hinsdale, N. H.

¶ CLARENCE A. BOWEN, '07, on December 15, 1928. He was plant engineer for the American Hide and Leather Company in Lowell, Mass.

¶ GEORGE S. S. PLAYFAIR, '07, on March 28, 1929, at Gravesend, Kent, England. Disabled during the World War, he subsequently became an employee of the English Government in the Division of Taxation.

¶ BENTON J. BROWN, '22, on March 9, 1929, in Chihuahua, Mexico. Assistant superintendent of the American Smelting and Refining Company.

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Transient Rates: $2.50, $3.00

ALLERTON

Chicago New York Cleveland

PRIMITIVE THINKING

(Continued from page 459)

seven deities who presided over the seven planets — and the seven gates of Babylon. They were acquainted with seven metals, each of which was under the influence of a planet and the patronage of a deity. The ancient scientists used the same symbols and the same names for all three.

Gold, the perfect metal, was sacred to the Sun, Sol, the Father God of the most ancient religions. The fire-worshipping Phoenicians, Druids, and Incas regarded it as sacred. The Sun has given its name to the first day of the week, Sunday, *Sonntag*, *dimanche* (*dies dominica*), the Lord's day.

Silver was sacred to the Moon, Luna, the Mother Goddess of the very old religions, Diana of the Romans. It corresponds to the second day of the week, Monday, moon day, *Montag*, *lundi* (*lunae dies*). Fused silver nitrate is still sold at the pharmacies under the name of "lunar caustic." The silver tree which is produced when a strip of copper is hung in a solution of silver nitrate was until recently pictured in the chemistry books over the legend, "*arbor Dianae*," or tree of Diana.

Iron was sacred to Mars, the god of war, who has given his name to the third day of the week, *mardi* (*martis dies*) in French, Tuesday (*Tiwes daeg*) in English from *Tiw*, the Anglo-Saxon counterpart of Mars. The alchemists called hydrated ferrous sulfate "*martial vitriol*." When it was distilled at a strong fire, it yielded "*martial ochre*" or rouge.

The god, the planet, and the metal, Mercury, have given their name to the fourth day of the week, *mercredi* (*mercurii dies*) in French, Wednesday in English after Woden, chief of the gods and patron of wisdom, poetry, and eloquence in the Norse mythology.

Tin, the brightest of all the metals, was sacred to Jupiter or Jove, hurler of thunderbolts. A rod of tin makes a crackling noise when it is bent. Thursday, in French *jeudi* (*jovis dies*) gets its name in the north-European languages from Thor, the Scandinavian god who had a short-handled hammer which the dwarfs had made for him. When he swung his hammer, the thunder rolled; when he threw it, the object of his aim was struck by lightning.

Copper was sacred to Venus, wife of Jupiter and goddess of love, who has given her name to the sixth day of the week, *vendredi* (*veneris dies*) in French, Friday in English and *Freitag* in German from Frigg, wife of Woden. The alchemists knew hydrated copper sulfate by the name of "*venereal vitriol*."

Lead, the dull metal, was under the influence of the dull planet, Saturn, and sacred to the god who has given his name to Saturday, the last day of the week. A saturnine person is one who is heavy, dull, gloomy, and possesses the nature of lead. The sweet taste of acetate of lead caused the alchemists to call it "*saccharum saturni*" or sugar of Saturn.

These few examples are particularly interesting to the student of the history of chemistry, and they are enough to show that occult science plays an important part in the everyday affairs of the Twentieth Century. Indeed, it is impossible to understand the history of science or the history of human development without taking large account of such matters. It is natural that this should be the case, for the beginnings of occult science are in

the spontaneous and unreasoned — so to speak, native — acts of the mind. The distinction of contraries and the bringing of them together again in a single unifying concept is our first *modus operandi* when we wish to think about things. The beginnings of occult science are themselves occult because they are hidden beneath the later experience of the race, but they are also the beginnings of authentic science. They lay down the method by which we attain our first understanding of phenomena.

WANDERINGS IN THE MIDDLE EAST

(*Continued from page 462*)

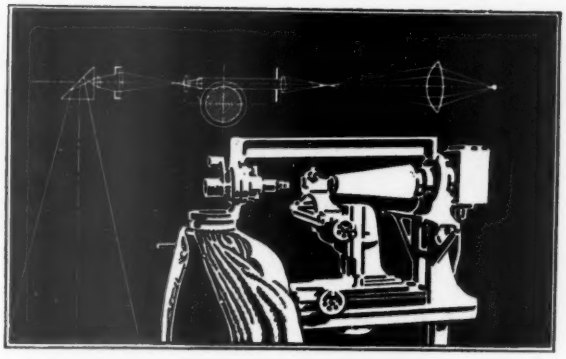
was overlooked. However, the city will long be remembered as having the poorest drinking water and the most unsanitary conditions of any city in Persia.

I passed on through various oil camps during the next several days under the guidance of the oil company's resident geologist, Martin Strong, and we were later joined by H. T. Mayo, the oil company's principal geologist in Persia. As we descended to the town of Fields shortly after dark, we saw bright lights and gas flares on the great oil field equaling those of any of our own western oil camps. We were welcomed to this town of well-oiled macadam roads and tasteful bungalows by the acting field manager, C. R. Clark. Here we visited the ancient ruins of the Masjid-i-Suleiman (probably a Zoroastrian fire-temple) and when I had studied the actual oil seepages in the vicinity and the quantities of natural gas under high pressure, it was not difficult to believe that the fire-temple may have been erected on a spot where natural gas once escaped, proving useful in Zoroastrian religious rites.

On the Karun River I had the opportunity of filming wild Bakhtiari tribesmen crossing the rapid torrent on inflated goat skins. It may have been near this spot that some of the scenes from "Grass" were photographed. This film was not pleasing to the Persians, but they should remember that the seemingly half-civilized scenes depicted of this belt of the country are not representative of all Persia. In this belt the tribesmen and their families are forced to migrate in order to keep pace with the seasonally changing climate and disappearing grass so necessary to their sheep and goats.

The return to Dar-i-Khasineh was made on the company's narrow gauge railroad. The rest of the trip to Ahwaz was made in my automobile. There I had a conference with one of the ministers of the government before I proceeded along the quadruple pipeline for Abandan, 135 miles from Fields. Here I inspected an oil refinery which was surprisingly prosperous and up-to-date, even to its fire department.

On account of seemingly endless formalities involved in transporting a Persian-owned automobile across 'Iraq, my men returned to Tehran, while I went into 'Iraq with only a secretary and a personal servant. Our luggage was carefully condensed into one box, and our passports and visas suited the red tape of the two nations. The railroad from this point passed through Mesopotamia where there was a shade temperature of 118° at (*Concluded on page 486*)



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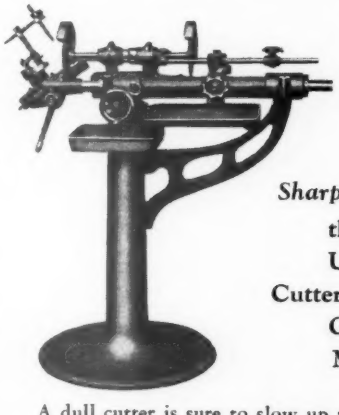

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WANDERINGS IN THE MIDDLE EAST

(Concluded from page 485)

this early season of the year. I passed the fabled site of the Garden of Eden, and the historic mount of Ur of the Chaldees, where Abraham was born, and pulled into Bagdad, where I inspected the ruins of Babylon. During this trip I was most hospitably entertained, and given every opportunity to inspect oil fields in the vicinity.

The oil fields of northeastern 'Iraq lie far from the ocean, but crude oil will probably be transported to the Mediterranean Sea by pipeline over 600 miles long. This line will be laid either entirely in British controlled territory or on French, according to the wishes of the stockholders. Either route is dangerously infested with bandits, as I proved when, returning westward, I was subjected to rifle fire. My entire collection of Persian rugs was stolen at that time by sixteen armed men and carried south into the Arabian desert.

I then returned to Khanakin to carry on my work at the Naft-Khaneh field. Although less than three years have elapsed since the first well was "brought in" and although oil has actually been produced through the pipeline to Khanakin for only two years, the field is an up-to-date one with modern equipment. My technical views on this field are included in reports made to the Persian Government. It will be interesting here merely to mention the similarity of some of the Naft-Khaneh problems with those of our own notorious Teapot Dome. Both fields lie astride an important boundary line, and they both, therefore, unfortunately share their technical interest with an admixture of politics. The paramount question for both is whether or not oil existing on one side of the boundary line can be tapped or its extractability affected by wells on the other side. This is the question, out of all those propounded to me, that it was easiest to answer on the basis of discoverable technologic conditions.

Since time was passing rapidly, I left in May for Tehran, after this circular journey from Tehran south to Bushire and north through Persia and 'Iraq back to Tehran, a journey of about 3,000 miles. Three months later my labors for the Imperial Government of Persia were finished and I returned by way of Beirut, Angora, and Constantinople to Paris where my family awaited me.

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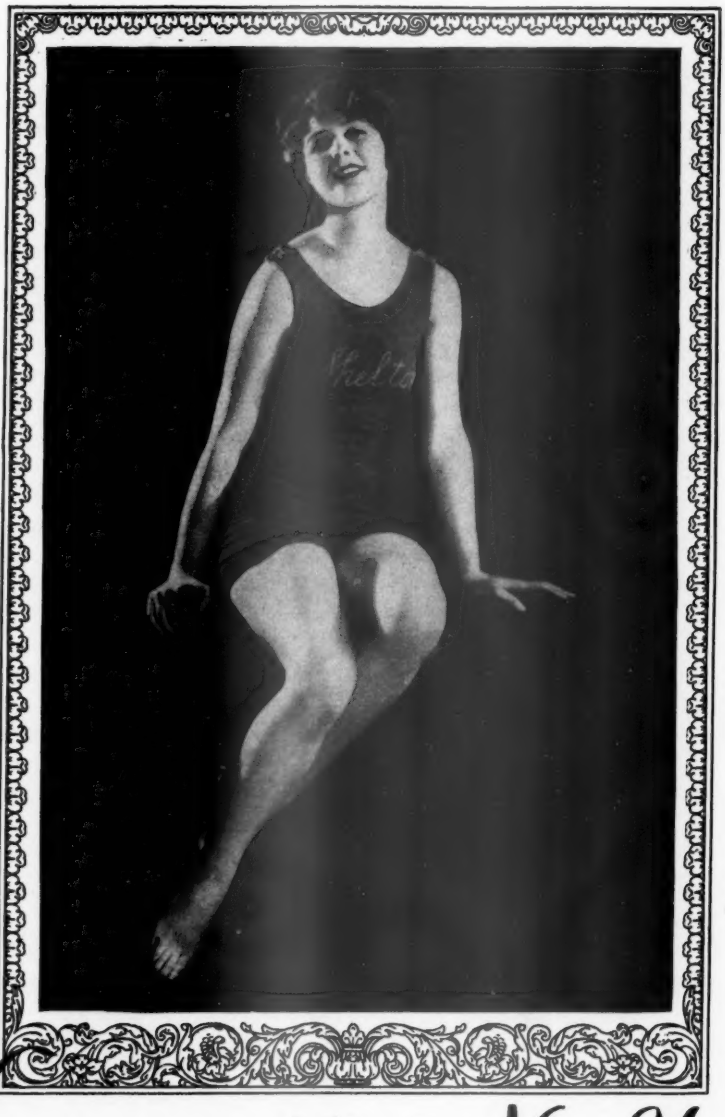

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THE WORLD'S FOOD

(*Continued from page 465*)

On the basis of 4.5 bushels per capita consumption, it is evident that we can continue to be an exporting nation for some years, but Canada, the Argentine, and Australia have relatively much larger surpluses as percentages of total crop to export. Canada produces one-half as much wheat as the United States and has but one-twelfth the population, Australia produces one-sixth and has but one-twentieth the population, while the Argentine produces one-fourth and has one-twentieth the population.

Perhaps, because of its importance to the white race, I have given too much attention to wheat. In regard to the meat supply, Europe may be fairly assumed to have been at the peak of production for many years. Countries with large areas not too densely populated, such as central North America, southern South America, and Australia, must supply the food necessary to maintain cattle, sheep, or hogs. In the United States the number of beef cattle raised has not materially increased in the last twenty years, although the number of dairy cattle has increased. Farming is encroaching on the great range areas. The number of sheep has already shown a decline, and swine, although now showing an upward trend, after a downward swing for a few years, may be approaching a maximum. Australia, New Zealand, and South America may be expected to be the chief sources of supply for the importing nations at no very distant future.

THE answer to the question of the world food problem depends on the point of view. We have the present reality of a world demanding more variety in foods but fairly well supplied as to immediate needs. It must not be forgotten, however, that the law of population increase is sometimes stated as a geometric progression while the increase in food supply is arithmetical. According to my friend, Dr. Edward M. East, it took perhaps 500,000 years for the population of the globe to reach 850 millions while in another hundred years it had doubled. By East's conservative estimate the yearly increase is about twelve millions, while Knibbs, who is also a careful statistician, places it at twenty millions. This means that every two years the additional food requirements of an England or a France must be provided, or in acres, allowing 2.3 acres per man, some forty million acres per year. Since the International Institute of Agriculture estimates that only about forty per cent of the total land area is arable, there is a total of 13,000 million acres available for food production.

The current rate of population increase is such as to double the population in sixty years, although in the United States it has doubled in about forty years and quadrupled in sixty years. But the percentage rate of increase is falling and, although it is impossible to be accurate, by the year 2000 the population will probably not greatly exceed 200 million. Even this number would utilize about all our present food production, and take us out of the surplus producing class.

With the rapidly increasing population it seems to me quite reasonable to suppose that (*Continued on page 490*)

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THE WORLD'S FOOD

(Continued from page 488)

more attention will be given to the present methods of food preservation and to devising new methods. We shall utilize in the future the methods of refrigeration and drying to a much greater extent. While the drying industry was important in the Colonial Period, the method has never received the attention it deserves. Vast quantities of food now wasted can be preserved for future use. This would mean not only a saving of actual materials but also in the cost of transportation of such foods. Dehydration was attempted during the Boer War when quantities of dehydrated vegetables were prepared for the troops in South Africa, and again to a greater extent in the World War. In my opinion the failure of dehydration to be established as an important food industry has been due to the lack of science devoted to the process. It is not sufficient simply to remove the water from food products; it is also necessary to see that this is done in the proper manner to preserve color and prevent spontaneous enzymatic changes. All materials cannot be dehydrated with equal success, as was illustrated by the Department of Agriculture and Army studies of certain types of fruits and vegetables. Tomatoes serve as a good example. They retain their food value, and save materially over the cost of manufacture and shipping of canned tomatoes.

Dried or dehydrated milk of the future will be sold in a grocery in the same way that flour and sugar are now. The lessened cost of transportation by the removal of the eighty-seven per cent of water, the ease in handling this dry powder, and the possibility of perfect sanitation without reducing the food value, are factors greatly in its favor.

The new methods of refrigeration which I have already mentioned and the development of small units of electric refrigeration offer a means of conservation of vast quantities of food material. By means of refrigeration fish may replace beef, mutton, and pork as a source of protein food. The enormous supply of fish in the tropics and the Arctic may become a commercial source of food for wide distribution.

AT THIS point I suggest that in a consideration of the world's supply of food in the future, both the tropics and the Arctic regions may be relied upon to an extent which we little appreciate. This is foreshadowed on the one hand by the development which has taken place in the cultivation and distribution of the banana. This fruit, although now imported in vast numbers, may supplement to a very great degree the vegetable supply. In composition and food value it is almost of equal rank with the potato and may be utilized in a great variety of ways. The fact that the banana and the plantain have for hundreds of years made up a large share of the food supply of the native races in the tropics attests to its possibilities. The banana, however, is but one of the tropical products which may add very greatly to the available foods of the future. Even a considerable portion of our meat supply may have its origin in those countries which have not up to the present time been regarded as well adapted to the production *(Concluded on page 492)*

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THE WORLD'S FOOD

(Concluded from page 490)

of cattle and other meat-producing animals. The application of the principles of breeding and selection have already been demonstrated as capable of producing animals of this sort and such production combined with refrigeration seems entirely feasible as a commercial development.

To turn to the other extreme, the tundras of the Arctic may contribute their share to the meat supply of the future. This seems not unlikely in view of the success which has attended the introduction of the reindeer into Alaska where, in the course of a generation, a few hundred animals have increased to approximately a half million. The meat of these animals is already being shipped commercially to the United States. Although the supply from this source is obviously limited, it may, nevertheless, become of real economic significance in view of the vast areas to which these animals seem able to adapt themselves.

If it does not appear too visionary I should like to suggest one other possible source of food supply, which may seem fantastic and extreme. Food preparation at the present time is rapidly passing from the domestic to the factory scale. Food manufacturing industries are rapidly developing, and in my opinion, will continue to develop both in magnitude and scope. By-products, formerly thrown away, have been made into edible and nutritious products, one example of which is in the utilization of blood serum into edible proteins.

Through the advances in biochemistry and other sciences, new eras in intensive agriculture will come. It is not only possible but extremely probable that we shall have synthetic foods prepared from products which can be grown in abundance, such as alfalfa, soy beans, peanuts, and perhaps from other quickly growing plants. The use of x-rays, ultraviolet, and other chemically active rays of solar energy, and the developments which are certain to come in biological and chemical science will find their applications in food production long before the world is brought to the verge of starvation. It is to science that we have turned to meet exigencies as they have arisen, and there was never a period of greater promise in scientific advance. It is to science the world must turn in the search for food if through natural processes the limitations of human increase do not adjust themselves.

Surveying present conditions it seems that we may look forward to the future with assurance. What a century hence may show is a matter for thoughtful speculation, but it seems reasonable to hope it may be met with confidence and broad constructive vision and ability by our children's children. But it is not too soon for us to point out to the young scientists of today the possibilities to which they are likely to fall heir, or the problems which they may be called upon to solve. It is for the technical institutions to aid the young scientists. They are enabled to offer advice from experts who appreciate the difficulties involved and to lend the use of their equipment for the solution of these problems. Here is one of the many tasks for education which is worthy of the institutions in which we have so deep and abiding faith.

BOOKS

(Continued from page 470)

small and poorly equipped sailboat. Aided only by a broken sextant and a pocket compass he navigated a distance of more than two thousand miles, encountering the most dangerous storms. Steady rain falls, lack of fresh food, and Jorgensen's madness could not deter him from his object and his hardiness in the face of almost insuperable difficulties was his greatest attraction.

Captain Cameron kept to the sea and ships until he was an old man, and even then he took long trips when the desire seized him. Only once did he take a long trip by land across Russia, and lamented the lost sight of the blue ocean. His type is now extinct, the Age of Sail is gone, yet the tales he told will never be equalled for their hazardous adventure.

The immense amount of material supplied to Mr. Farrell in the copious notes of Captain Cameron must have been embarrassing. Compression had to be resorted to, and the latter half of the book shows this badly. The narrative style becomes lost in a desire to get in all the facts. Mr. Farrell has done well to get material enough for several volumes into the space of less than five hundred pages. The wealth of illustration and marginal drawings are happily chosen, and do much to give realism to the reader.

A companion volume to this, similar both in content and manner, is the "Adventures of an African Slaver," by Theodore Canot (Albert and Charles Boni), reviewed in the February issue.

C. C. C.

Books in Brief

THE FLIGHT OF THE SOUTHERN CROSS, by C. E. Kingsford-Smith and C. T. P. Ulm. $2.50. 295 pages. New York: *Robert M. McBride and Company*.

ASIDE from twenty-two pages giving the actual log entries of this airplane on its journey from California to Australia this account has no special merit. The authors, with two American companions (a navigator and radio operator, to whom they give due credit), flew the 8,500 miles with two intermediate stops at the Hawaiian and Fiji Islands, truly an astounding accomplishment. They stress the careful preparation they made for their flight but their book bears the earmarks of hasty writing and it sorely lacks an index.

COCHRANE, THE UNCONQUERABLE, by Archibald D. Turnbull and Norman R. Van der Veer. $2.50. 319 pages. New York: *The Century Company*.

UNJUSTLY deprived of his native British honors, red-headed Admiral Tom, seafighter extraordinary of the Napoleonic era, emigrates to South America. There he commands the Chilean fleet and whips the Spaniards. Afterward he takes over the Brazilian fleet and whips the Portuguese. Then all is well and he is able to go back home.

(*Concluded on page 494*)

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Eventually, aided by Lady Kitty, his faithful spouse, he again obtains caste in England, is restored to the Bath and the Royal Navy list, resumes his heritage as tenth Earl of Dundonald, is named commander-in-chief of the North American and West Indian Squadron.

Mr. Turnbull recently was the biographer of a less rough and tumble existence. His "John Stevens: An American Record" was commented upon in The Review for January, 1929.

THE TURNING POINT OF THE REVOLUTION, by Hoffman Nickerson. $6.00. 500 pages. Boston: *Houghton Mifflin Company*.

PRIMARILY the book, thoroughly packed with details, treats of the Battle of Saratoga and of unfortunate Lieutenant General John Burgoyne's part in it. As the central figure of a military disaster ranked as one of the fifteen decisive battles of the world, his permanent place in history was assured.

The author, who served on the general staff of the American Expeditionary Force during the late war, has done a thoroughgoing piece of writing. In content and literary style, this book takes first rank among the great number already existing about the campaign.

THE PROFESSION OF ENGINEERING, edited by Dugald C. Jackson, Jr., '21, and W. Paul Jones. $1.50. vii+124 pages. New York: *John Wiley and Sons, Inc.*

WITH this collection of essays from the pens of such well-known men as Daniel Webster Mead, George Hale Barrus, '74, John Hays Hammond, and President Hoover, the editors have attempted to explain the various kinds of engineering.

OPERATIONAL CIRCUIT ANALYSIS, by Vannevar Bush, '16. $4.50. x+392 pages. New York: *John Wiley and Sons, Inc.*

PROFESSOR BUSH, who, in the absence of Professor Dugald C. Jackson, will, during the coming year, be Acting Head of the Institute's Department of Electrical Engineering, has in this book presented an extension and codification of the mathematics of operational circuit analysis which have grown up since the original work by Oliver Heaviside. Says the author: "I have attempted to include all the essential features of the Heaviside type of operational analysis, and to show their dependence upon the classic processes which constitute their background. This may make the reading difficult for those students who meet certain branches of mathematics for the first time; but it will serve a useful purpose if it demonstrates the usefulness of extending their mathematical equipment along the lines indicated. After all a little mathematical knowledge can be a dangerous thing, and the use of operational methods except for pure computation should be accompanied by an appreciation of the logic of more than simple algebra."

Professor Norbert Wiener, author of the article "Einsteiniana" in the May issue of The Review, has contributed an appendix treating of certain mathematical points in the text. "I did not know an engineer and a mathematician could have such good times together. I only wish that I could get the real vital grasp of the basic logic of mathematics that he has of the basic principles of physics," remarks Dr. Bush of his collaborator.

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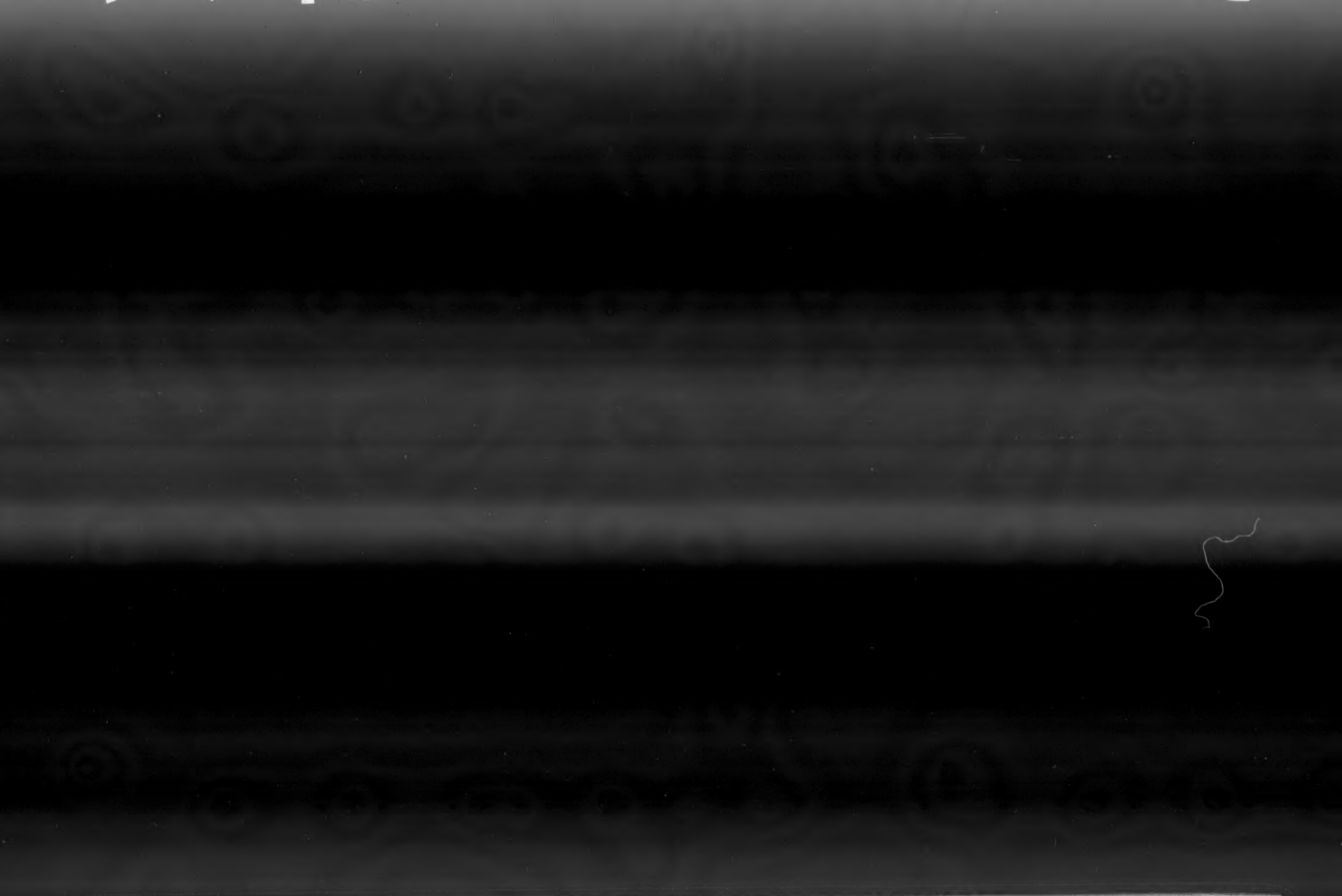
17 COURT STREET, BOSTON, MASSACHUSETTS

52 TEMPLE PLACE 83 MASSACHUSETTS AVENUE 222 BOYLSTON STREET 167 SUMMER STREET NORTH STATION

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